code of federal regulations

40/pt. 86-99/990

Protection of Environment

40

PARTS 86 TO 99
Revised as of July 1, 1990

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Protection of Environment

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PARTS 86 TO 99

Revised as of July 1, 1990

CONTAINING
A CODIFICATION OF DOCUMENTS
OF GENERAL APPLICABILITY
AND FUTURE EFFECT

AS OF JULY 1, 1990
With Ancillaries

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1985

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Cite this Code: **CFR**

To cite the regulations in this volume use title, part and section number. Thus, **40 CFR 86.078–3** *refers to title 40, part 86, section 078–3.*

Explanation

The Code of Federal Regulations is a codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government. The Code is divided into 50 titles which represent broad areas subject to Federal regulation. Each title is divided into chapters which usually bear the name of the issuing agency. Each chapter is further subdivided into parts covering specific regulatory areas.

ISSUE DATES

Each volume of the Code is revised at least once each calendar year and issued on a quarterly basis approximately as follows:

Title 1 through Title 16	as of January 1
Title 17 through Title 27	as of April 1
Title 28 through Title 41	as of July 1
Title 42 through Title 50	as of October 1

The appropriate revision date is printed on the cover of each volume.

LEGAL STATUS

The contents of the Federal Register are required to be judicially noticed (44 U.S.C. 1507). The Code of Federal Regulations is prima facie evidence of the text of the original documents (44 U.S.C. 1510).

HOW TO USE THE CODE OF FEDERAL REGULATIONS

The Code of Federal Regulations is kept up to date by the individual issues of the Federal Register. These two publications must be used together to determine the latest version of any given rule.

To determine whether a Code volume has been amended since its revision date (in this case, July 1, 1990), consult the "List of CFR Sections Affected (LSA)," which is issued monthly, and the "Cumulative List of Parts Affected," which appears in the Reader Aids section of the daily Federal Register. These two lists will identify the Federal Register page number of the latest amendment of any given rule.

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Each volume of the Code contains amendments published in the Federal Register since the last revision of that volume of the Code. Source citations for the regulations are referred to by volume number and page number of the Federal Register and date of publication. Publication dates and effective dates are usually not the same and care must be exercised by the user in determining the actual effective date. In instances where the effective date is beyond the cut-off date for the Code a note has been inserted to reflect the future effective date. In those instances where a regulation published in the Federal Register states a date certain for expiration, an appropriate note will be inserted following the text.

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The Paperwork Reduction Act of 1980 (Pub. L. 96-511) requires Federal agencies to display an OMB control number with their information collection request. Many agencies have begun publishing numerous OMB control numbers as amendments to existing regulations in the CFR. These OMB numbers are placed as close as possible to the applicable recordkeeping or reporting requirements.

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Provisions that become obsolete before the revision date stated on the cover of each volume are not carried. Code users may find the text of provisions in effect on a given date in the past by using the appropriate numerical list of sections affected. For the period before January 1, 1973, consult either the List of CFR Sections Affected, 1949-1963, or 1964-1972, published in three separate volumes. For the period beginning January 1, 1973, a "List of CFR Sections Affected" is published at the end of each CFR volume.

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What is incorporation by reference? Incorporation by reference was established by statute and allows Federal agencies to meet the requirement to publish regulations in the Federal Register by referring to materials already published elsewhere. For an incorporation to be valid, the Director of the Federal Register must approve it. The legal effect of incorporation by reference is that the material is treated as if it were published in full in the Federal Register (5 U.S.C. 552(a)). This material, like any other properly issued regulation, has the force of law.

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(b) The matter incorporated is in fact available to the extent necessary to afford fairness and uniformity in the administrative process.

(c) The incorporating document is drafted and submitted for publication in accordance with 1 CFR Part 51.

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III). A list of CFR Titles, Chapters, and Parts and an alphabetical list of agencies publishing in the CFR are also included in this volume.

An index to the text of "Title 3—The President" is carried within that volume.

The Federal Register Index is issued monthly in cumulative form. This index is based on a consolidation of the "Contents" entries in the daily Federal Register.

A List of CFR Sections Affected (LSA) is published monthly, keyed to the revision dates of the 50 CFR titles.

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There are no restrictions on the republication of material appearing in the Code of Federal Regulations.

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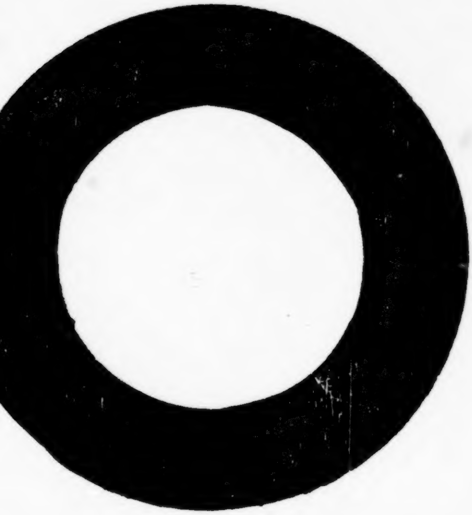
For a summary, legal interpretation, or other explanation of any regulation in this volume, contact the issuing agency. Inquiries concerning editing procedures and reference assistance with respect to the Code of Federal Regulations may be addressed to the Director, Office of the Federal Register, National Archives and Records Administration, Washington, D.C. 20408 (telephone 202-523-3517). Sales are handled exclusively by the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 (telephone 202-783-3238).

MARTHA L. GIRARD,
Director,
Office of the Federal Register.

July 2, 1990.



THIS TITLE

Title 40—PROTECTION OF ENVIRONMENT is composed of fifteen volumes. The parts in these volumes are arranged in the following order: Parts 1-51, Part 52, Parts 53-60, Parts 61-80, Parts 81-85, Parts 86-99, Parts 100-149, Parts 150-189, Parts 190-259, Parts 260-299, Parts 300-399, Parts 400-424, Parts 425-699, Parts 700-789 and Part 790 to End. A derivation table appears in the volume containing Parts 1-51. The contents of these volumes represent all current regulations codified under this title of the CFR as of July 1, 1990.

Chapter I—Environmental Protection Agency appears in all fifteen volumes. A Pesticide Tolerance Commodity/Chemical Index appears in Parts 150-189. A Toxic Substances Chemical—CAS Number Index appears in Parts 700-789 and Part 790 to End. Distribution Tables appear in the volumes containing Parts 100-149 and Parts 190-299. Redesignation Tables appear in the volumes containing Parts 1-51, Parts 81-85, Parts 86-99, Parts 150-189, and Parts 700-789. Regulations issued by the Council on Environmental Quality appear in the volume containing Part 790 to End.

For this volume, Linda Landis Jones was Chief Editor. The Code of Federal Regulations publication program is under the direction of Richard L. Claypoole, assisted by Alomha S. Morris.

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(This book contains Parts 86-99)

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AUTHORITY: Secs. 202, 203, 206, 207, 208, 215, 301(a), of the Clean Air Act as Amended; 42 U.S.C. 7521, 7522, 7524, 7525, 7541, 7542, 7549, 7550 and 7601(a).

Subpart A—General Provisions for Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles, 1977 and Later Model Year New Light-Duty Trucks, 1977 and Later Model Year New Heavy-Duty Engines, and for 1985 and Later Model Year New Gasoline-Fueled Heavy-Duty Vehicles

SOURCE: 42 FR 32907, June 28, 1977, unless otherwise noted.

§ 86.078-3 Abbreviations.

(a) The abbreviations in this section apply to this subpart and also to Subparts B, D, H, I, J, N, O and P of this part and have the following meanings:

accel.—acceleration.
AECD—Auxiliary emission control device.
API—American Petroleum Institute.
ASTM—American Society for Testing and Materials.
BHP—Brake horsepower.
BSCO—Brake specific carbon monoxide.
BSHC—Brake specific hydrocarbons.
$BSNO_x$—Brake specific oxides of nitrogen.
C—Celsius.
cfh—cubic feet per hour.
CFV—Critical flow venturi.
CFV-CVS—Critical flow venturi—constant volume sampler.
CL—Chemiluminescence.
CO_2—carbon dioxide.
CO—Carbon monoxide.
conc.—concentration.
cfm—cubic feet per minute.
CT—Closed throttle.
cu. in.—cubic inch(es).
CVS—Constant volume sampler.
decel.—deceleration.
EP—End point.
evap.—evaporative.
F—Fahrenheit.
FID—Flame ionization detector.
FL—Full load.
ft.—feet.
g—gram(s).
gal.—U.S. gallon(s).
GVW—Gross vehicle weight.
GVWR—Gross vehicle weight rating.
h—hour(s).
H_2O—water.
HC—hydrocarbon(s).
HFID—Heated flame ionization detector.
Hg—mercury.
hi—high.
hp.—horsepower.
IBP—Initial boiling point.
ID—Internal diameter.
in.—inch(es).
K—kelvin.
kg—kilogram(s).
km—kilometer(s).
kPa—kilopascal(s).
lb.—pound(s).
lb.-ft.—pound-feet.
m—meter(s).
max.—maximum.
mg—milligram(s).
mi.—mile(s).
min.—minute(s).
ml—milliliter(s).
mm—millimeter(s).
mph—miles per hour.
mv—millivolt(s).
N_2—nitrogen.
NDIR—Nondispersive infrared.
NO—nitric oxide.
NO_2—nitrogen dioxide.
NO_x—oxides of nitrogen.
No.—Number.
O_2—oxygen.
Pb—lead.
pct.—percent.
PDP-CVS—Positive displacement pump—constant volume sampler.
ppm—parts per million by volume.
ppm C—parts per million, carbon.
psi—pounds per square inch.
psig—pounds per square inch gauge.
PTA—Part throttle acceleration.
PTD—Part throttle deceleration.
R—Rankin.
rpm—revolutions per minute.
RVP—Reid vapor pressure.
s—second(s).
SAE—Society of Automotive Engineers.
SI—International system of units.
sp.—speed.
TEL—Tetraethyl lead.
TML—Tetramethyl lead.
UDDS—Urban dynamometer driving schedule.
V—volt(s).
vs—versus.
W—watt(s).
WF—Weighting factor.
WOT—Wide open throttle.
wt.—weight.
'—feet.
"—inch(es).
°—degree(s).
Σ—summation.

[42 FR 32907, June 28, 1977, as amended at 45 FR 4149, Jan. 21, 1980]

§ 86.078-6 Hearings on certification.

(a)(1) After granting a request for a hearing under § 86.084-22, § 86.084-30(b), or § 86.084-30(c), the Administrator shall designate a Presiding Officer for the hearing.

(2) The General Counsel will represent the Environmental Protection Agency in any hearing under this section.

(3) If a time and place for the hearing have not been fixed by the Administrator under § 86.084.22, § 86.084-30(b), or § 86.084-30(c), the hearing shall be held as soon as practicable at a time and place fixed by the Administrator or by the Presiding Officer.

(4) In the case of any hearing requested pursuant to § 86.078-30(c)(5)(i), the Administrator may in his discretion direct that all argument and presentation of evidence be concluded within such fixed period not less than 30 days as he may establish from the date that the first written offer of a hearing is made to the manufacturer. To expedite proceedings, the Administrator may direct that the decision of the Presiding Officer (who may, but need not be the Administrator himself) shall be the final EPA decision.

(b)(1) Upon his appointment pursuant to paragraph (a) of this section, the Presiding Officer will establish a hearing file. The file shall consist of the notice issued by the Administrator under § 86.084-22, § 86.084-30(b), or § 86.084-30(c) together with any accompanying material, the request for a hearing and the supporting data submitted therewith, and all documents relating to the request for certification and all documents submitted therewith, and correspondence and other data material to the hearing.

(2) The hearing file will be available for inspection by the applicant at the office of the Presiding Officer.

(c) An applicant may appear in person, or may be represented by counsel or by any other duly authorized representative.

(d)(1) The Presiding Officer upon the request of any party, or in his discretion, may arrange for a prehearing conference at a time and place specified by him to consider the following:

(i) Simplification of the issues;

(ii) Stipulations, admissions of fact, and the introduction of documents;

(iii) Limitation of the number of expert witnesses;

(iv) Possibility of agreement disposing of all or any of the issues in dispute;

(v) Such other matters as may aid in the disposition of the hearing, including such additional tests as may be agreed upon by the parties.

(2) The results of the conference shall be reduced to writing by the Presiding Officer and made part of the record.

(e)(1) Hearings shall be conducted by the Presiding Officer in an informal but orderly and expeditious manner. The parties may offer oral or written evidence, subject to the exclusion by the Presiding Officer of irrelevant, immaterial and repetitious evidence.

(2) Witnesses will not be required to testify under oath. However, the Presiding Officer shall call to the attention of witnesses that their statements may be subject to the provisions of title 18 U.S.C. 1001 which imposes penalties for knowingly making false statements or representations, or using false documents in any matter within the jurisdiction of any department or agency of the United States.

(3) Any witness may be examined or cross-examined by the Presiding Officer, the parties, or their representatives.

(4) Hearings shall be reported verbatim. Copies of transcripts of proceedings may be purchased by the applicant from the reporter.

(5) All written statements, charts, tabulations, and similar data offered in evidence at the hearings shall, upon a showing satisfactory to the Presiding Officer of their authenticity, relevancy, and materiality, be received in evidence and shall constitute a part of the record.

(6) Oral argument may be permitted in the discretion of the Presiding Officer and shall be reported as part of the record unless otherwise ordered by him.

(f)(1) The Presiding Officer shall make an initial decision which shall include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law, or discretion presented on the record. The findings, conclusions, and written decision shall be provided to the parties and made a part of the record. The initial decision shall become the decision of the Administrator without further proceedings unless there is an appeal to the Administrator or motion for review by the Administrator within 20 days of the date the initial decision was filed.

(2) On appeal from or review of the initial decision the Administrator shall have all the powers which he would have in making the initial decision including the discretion to require or allow briefs, oral argument, the taking of additional evidence or the remanding to the Presiding Officer for additional proceedings. The decision by the Administrator shall include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law, or discretion presented on the appeal or considered in the review.

[42 FR 32907, June 28, 1977, as amended at 49 FR 48479, Dec. 12, 1984]

§ 86.078-7 Maintenance of records; submittal of information; right of entry.

(a) The manufacturer of any new motor vehicle (or new motor vehicle engine) subject to any of the standards or procedures prescribed in this subpart shall establish, maintain and retain the following adequately organized and indexed records.

(1) *General records.* (i) The records required to be maintained by this paragraph shall consist of:

(A) Identification and description of all certification vehicles (or certification engines) for which testing is required under this subpart.

(B) A description of all emission control systems which are installed on or incorporated in each certification vehicle (or certification engine).

(C) A description of all procedures used to test each such certification vehicle (or certification engine).

(ii) A properly filed application for certification, following the format prescribed by the US EPA for the appropriate model year, fulfills each of the requirements of this paragraph (a)(1).

(2) *Individual records.* (i) A brief history of each motor vehicle (or motor vehicle engine) used for certification under this subpart including:

(A) In the case where a current production engine is modified for use in a certification vehicle (or as a certification engine), a description of the process by which the engine was selected and of the modifications made. In the case where the engine for a certification vehicle (or certification engine) is not derived from a current production engine, a general description of the buildup of the engine (e.g., experimental heads were cast and machined according to supplied drawings, etc.). In both cases above, a description of the origin and selection process for the carburetor, distributor, fuel system components, fuel injection components, emission control system components, smoke exhaust emission control system components, and exhaust aftertreatment devices as applicable, shall be included. The required descriptions shall specify the steps taken to assure that the certification vehicle (or certification engine) with respect to its engine, drivetrain, fuel system, emission control system components, exhaust aftertreatment devices, smoke exhaust emission control system components, vehicle weight or any other devices or components, as applicable, that can reasonably be expected to influence exhaust or evaporative emissions, as applicable, will be representative of production vehicles (or engines) and that either all components and/or vehicles (or engine) construction processes, component inspection and selection techniques, and assembly techniques employed in constructing such vehicles (or engines) are reasonably likely to be implemented for production vehicles (or engines) or that they are as closely analogous as practicable to planned construction and assembly processes.

(B) A complete record of all emission tests performed (except tests performed by EPA directly), including test results, the date and purpose of each test, and the number of miles accumulated on the vehicle (or the number of hours accumulated on the engine).

(C) The date of each mileage (or service) accumulation run, listing the mileage (or number of operating hours) accumulated.

(D) [Reserved]

(E) A record and description of all maintenance and other servicing performed, giving the date of the maintenance or service and the reason for it.

(F) A record and description of each test performed to diagnose engine or emission control system performance, giving the date and time of the test and the reason for it.

(G) [Reserved]

(H) A brief description of any significant events affecting the vehicle (or engine) during any time in the period covered by the history not described by an entry under one of the previous headings including such extraordinary events as vehicle accidents (or accidents involving the engine) or dynamometer runaway.

(ii) Each such history shall be started on the date that the first of any of the selection or buildup activities in paragraph (a)(2)(i)(A) of this section occurred with respect to the certification vehicle (or engine), shall be updated each time the operational status of the vehicle (or engine) changes or additional work is done on it, and shall be kept in a designated location.

(3) All records, other than routine emission test records, required to be maintained under this subpart shall be retained by the manufacturer for a period of six (6) years after issuance of all certificates of conformity to which they relate. Routine emission test records shall be retained by the manufacturer for a period of one (1) year after issuance of all certificates of conformity to which they relate. Records may be retained as hard copy or reduced to microfilm, punch cards, etc., depending on the record retention procedures of the manufacturer, *provided*, that in every case all the information contained in the hard copy shall be retained.

(b) The manufacturer of any new motor vehicle (or new motor vehicle engine) subject to any of the standards prescribed in this subpart shall submit to the Administrator at the time of issuance by the manufacturer copies of all instructions or explanations regarding the use, repair, adjustment, maintenance, or testing of such vehicle (or engine) relevant to the control of crankcase, exhaust or evaporative emissions, as applicable, issued by the manufacturer for use by other manufacturers, assembly plants, distributors, dealers, and ultimate purchasers; *Provided*, That any material not translated into the English language need not be submitted unless specifically requested by the Administrator.

(c)(1) Any manufacturer who has applied for certification of a new motor vehicle (or new motor vehicle engine) subject to certification test under this subpart shall admit or cause to be admitted any EPA Enforcement Officer during operating hours on presentation of credentials to any of the following:

(i) Any facility where any such tests or any procedures or activities connected with such tests are or were performed.

(ii) Any facility where any new motor vehicle (or new motor vehicle engine) which is being, was, or is to be tested is present.

(iii) Any facility where any construction process or assembly process used in the modification or build up of such a vehicle (or engine) into a certification vehicle (or certification engine) is taking place or has taken place.

(iv) Any facility where any record or other document relating to any of the above is located.

(2) Upon admission to any facility referred to in paragraph (c)(1) of this section, any EPA Enforcement Officer shall be allowed:

(i) To inspect and monitor any part or aspect of such procedures, activities, and testing facilities, including, but not limited to, monitoring vehicle (or engine) preconditioning, emissions tests and mileage (or service) accumulation, maintenance, and vehicle soak and storage procedures (or engine storage procedures), and to verify correlation or calibration of test equipment;

(ii) To inspect and make copies of any such records, designs, or other documents; and

(iii) To inspect and/or photograph any part or aspect of any such certification vehicle (or certification engine) and any components to be used in the construction thereof.

(3) In order to allow the Administrator to determine whether or not pro-

duction motor vehicles (or production motor vehicle engines) conform in all material respects to the design specifications which applied to those vehicles (or engines) described in the application for certification for which a certificate of conformity has been issued to standards prescribed under section 202 of the Act, any manufacturer shall admit any EPA Enforcement Officer on presentation of credentials to both:

(i) Any facility where any document, design, or procedure relating to the translation of the design and construction of engines and emission related components described in the application for certification or used for certification testing into production vehicles (or production engines) is located or carried on; and

(ii) Any facility where any motor vehicles (or motor vehicle engines) to be introduced into commerce are manufactured or assembled.

(4) On admission to any such facility referred to in paragraph (c)(3) of this section, any EPA Enforcement Officer shall be allowed:

(i) To inspect and monitor any aspects of such manufacture or assembly and other procedures;

(ii) To inspect and make copies of any such records, documents or designs; and

(iii) To inspect and photograph any part or aspect of any such new motor vehicles (or new motor vehicle engines) and any component used in the assembly thereof that are reasonably related to the purpose of his entry.

(5) Any EPA Enforcement Officer shall be furnished by those in charge of a facility being inspected with such reasonable assistance as he may request to help him discharge any function listed in this paragraph. Each applicant for or recipient of certification is required to cause those in charge of a facility operated for its benefit to furnish such reasonable assistance without charge to EPA whether or not the applicant controls the facility.

(6) The duty to admit or cause to be admitted any EPA Enforcement Officer applies whether or not the applicant owns or controls the facility in question and applies both to domestic and to foreign manufacturers and facilities. EPA will not attempt to make any inspections which it has been informed that local law forbids. However, if local law makes it impossible to do what is necessary to insure the accuracy of data generated at a facility, no informed judgment that a vehicle or engine is certifiable or is covered by a certificate can properly be based on those data. It is the responsibility of the manufacturer to locate its testing and manufacturing facilities in jurisdictions where this situation will not arise.

(7) For purposes of this paragraph:

(i) "Presentation of credentials" shall mean display of the document designating a person as an EPA Enforcement Officer.

(ii) Where vehicle, component, or engine storage areas or facilities are concerned, "operating hours" shall mean all times during which personnel other than custodial personnel are at work in the vicinity of the area or facility and have access to it.

(iii) Where facilities or areas other than those covered by paragraph (c)(7)(ii) of this section are concerned, "operating hours" shall mean all times during which an assembly line is in operation or all times during which testing, maintenance, mileage (or service) accumulation, production or compilation of records, or any other procedure or activity related to certification testing, to translation of designs from the test stage to the production stage, or to vehicle (or engine) manufacture or assembly is being carried out in a facility.

(iv) "Reasonable assistance" includes, but is not limited to, clerical, copying, interpretation and translation services, the making available on request of personnel of the facility being inspected during their working hours to inform the EPA Enforcement Officer of how the facility operates and to answer his questions, and the performance on request of emissions tests on any vehicle (or engine) which is being, has been, or will be used for certification testing. Such tests shall be nondestructive, but may require appropriate mileage (or service) accumulation. A manufacturer may be compelled to cause the personal appearance of any employee at such a facility before an EPA Enforcement Officer by written request for his appearance, signed by the Assistant Administrator for Enforcement, served on the manufacturer. Any such employee who has been instructed by the manufacturer to appear will be entitled to be accompanied, represented, and advised by counsel.

(v) Any entry without 24 hour prior written or oral notification to the affected manufacturer shall be authorized in writing by the Assistant Administrator for Enforcement.

[42 FR 32907, June 28, 1977, as amended at 45 FR 63747, Sept. 25, 1980; 47 FR 49807, Nov. 1, 1982]

§ 86.079-31 Separate certification.

Where possible a manufacturer should include in a single application for certification all vehicles (or engines) for which certification is required. A manufacturer may, however, choose to apply separately for certification of part of his product line. The selection of test vehicles (or test engines) and the computation of test results will be determined separately for each application.

[42 FR 45149, Sept. 8, 1977]

§ 86.079-32 Addition of a vehicle or engine after certification.

(a) If a manufacturer proposes to add to his product line a vehicle (or engine) of the same engine-system combination as vehicles (or engines) previously certified but which was not described in the application for certification when the test vehicle(s) (or test engine(s)) representing other vehicles (or engines) of that combination was certified, he shall notify the Administrator. Such notification shall be in advance of the addition unless the manufacturer elects to follow the procedure described in § 86.079-34. This notification shall include a full description of the vehicle (or engine) to be added.

(b) The Administrator may require the manufacturer to perform such tests on the test vehicle(s) (or test engine(s)) representing the vehicle (or engine) to be added which would have been required if the vehicle (or engine) had been included in the original application for certification.

(c) If, after a review of the test reports and data submitted by the manufacturer, and data derived from any testing conducted under § 86.079-29, the Administrator determines that the test vehicle(s) or test engine(s) meets all applicable standards, the appropriate certificate will be amended accordingly. If the Administrator determines that the test vehicle(s) (or test engine(s)) does not meet applicable standards, he will proceed under § 86.079-30(b).

[42 FR 45149, Sept. 8, 1977]

§ 86.079-33 Changes to a vehicle or engine covered by certification.

(a) The manufacturer shall notify the Administrator of any change in production vehicles (or production engines) in respect to any of the parameters listed in § 86.079-24(a)(3), § 86.079-24(b)(1)(iii), § 86.079-24(b)(2)(iii) or § 86.079-24(b)(3)(iii) as applicable, giving a full description of the change. Such notification shall be in advance of the change unless the manufacturer elects to follow the procedure described in § 86.079-34.

(b) Based upon the description of the change, and data derived from such testing as the Administrator may require or conduct. The Administrator will determine whether the vehicle (or engine), as modified, would still be covered by the certificate of conformity then in effect.

(c) If the Administrator determines that the outstanding certificate would cover the modified vehicles (or engines) he will notify the manufacturer in writing. Except as provided in § 86.079-34 the change may not be put into effect prior to the manufacturer's receiving this notification. If the Administrator determines that the modified vehicles (or engines) would not be covered by the certificate then in effect, the modified vehicles (or engines) shall be treated as additions to the product line subject to § 86.079-32.

[42 FR 45149, Sept. 8, 1977]

§ 86.079-36 Submission of vehicle identification numbers.

(a) Upon request of the Administrator, the manufacturer of any light-duty vehicle or light-duty truck covered by a certificate of conformity shall, within 30 days, identify by vehicle identification number, the vehicle(s) covered by the certificate of conformity.

(b) The manufacturer of any light-duty vehicle or light-duty truck covered by a certificate of conformity shall provide to the Administrator, within 60 days of the issuance of a certificate of conformity, an explanation of the elements in any vehicle identification coding system in sufficient detail to enable the Administrator to identify those vehicles which are covered by a certificate of conformity.

[43 FR 52920, Nov. 14, 1978]

§ 86.079-39 Submission of maintenance instructions.

(a) The manufacturer shall provide to the Administrator, no later than the time of the submission required by § 86.079-23, a copy of the maintenance instructions which the manufacturer proposes to supply to the ultimate purcahser in accordance with § 86.079-38(a). The Administrator will review such instructions to determine whether they are reasonable and necessary to assure the proper functioning of the vehicle's (or engine's emission control systems. The Administrator will notify the manufacturer of his determination whether such instructions are reasonable and necessary to assure the proper functioning of the emission control systems.

(b) Any revision to the maintenance instructions which will affect emissions shall be supplied to the Administrator at least 30 days before being supplied to the ultimate purchaser unless the Administrator consents to a lesser period of time.

[42 FR 45151, Sept. 8, 1977]

§ 86.080-12 Alternative certification procedures.

(a)(1) The Administrator will determine which of the following certification procedures (paragraph (a)(3) or (a)(4) of this section) may be used to demonstrate compliance for each heavy-duty engine, light-duty vehicle, and light-duty truck engine family for which certification is sought.

(2) The families selected for the procedure described in paragraph (a)(3) of this section will be subject to this procedure at the option of the manufacturer.

(3) The following provisions apply to those heavy-duty engine, light-duty vehicle, and light-duty truck engine families which the Administrator has specified may be subject to the abbreviated certification review procedure.

(i) The manufacturer shall satisfy all applicable requirements of Part 86 necessary to demonstrate compliance with the applicable standards for each class of new motor vehicles or new motor vehicle engines for which certification is sought.

(ii) As specifically allowed by the Administrator, the manufacturer shall assume the responsibility for part or all of the decisions applicable to the family for which certification is sought and which are within the jurisdiction of the Administrator, with the exception that the Administrator will determine whether a test vehicle, or test engine, has met the applicable emission standards.

(iii) The manufacturer shall maintain, update, and correct all records and information required.

(iv) The Administrator may review a manufacturer's records at any time. At the Administrator's discretion, this review may take place either at the manufacturer's facility or at another facility designated by the Administrator.

(v) At the Administrator's request, the manufacturer shall notify the Administrator of the status of the certification program including projected schedules of those significant accomplishments specified by the Administrator.

(vi) The manufacturer shall permit the Administrator to inspect any facilities, records, and vehicles from which data are obtained under the abbreviated certification review procedure.

(vii) Upon completing all applicable requirements of Part 86, the manufacturer shall submit a separate application for a certificate of conformity for each set of standards and each class of new motor vehicles or new motor vehicle engines for which certification is sought. Such application shall be made in writing to the Administrator by the manufacturer.

(A) The Administrator may approve or disapprove, in whole or in part, an application for certification according to the procedures specified in § 86.080-22(b).

(B) If, after a review of the application for certification, test reports and data submitted by the manufacturer, data obtained during an inspection, and any other pertinent data or information, the Administrator determines that a test vehicle(s) or test engine(s) has not met the requirements of the Act and the applicable subpart, he will notify the manufacturer in writing and set forth the reason(s) for the determination as specified in § 86.080-22(c).

(4) Those families which are to be subjected to the complete EPA review procedure will follow the procedures specified in this subpart with the exception of § 86.080-12(a)(3).

(b) The manufacturer may request that an engine family be subject to the abbreviated certification review procedure.

(c) The Administrator may require that an engine family previously allowed to be subject to the abbreviated certification review procedure be transferred to the complete review procedure.

[45 FR 26045, Apr. 17, 1980]

§ 86.081-8 Emissions standards for 1981 light-duty vehicles.

(a)(1) Exhaust emissions from 1981 and later model year light-duty vehicles shall not exceed:

(i) *Hydrocarbons.* 0.41 grams per vehicle mile (0.255 grams per vehicle kilometer);

(ii) *Carbon monoxide.* 3.4 grams per vehicle mile (2.11 grams per vehicle kilometer), except that carbon monoxide emissions from light-duty vehicles of the following 1981 model year engine families shall not exceed 7.0 grams per vehicle mile (4.35 grams per vehicle kilometer):

Manufacturer	Engine family
American Motors Corp	151 CID.
	258 CID.
BL Cars, Ltd	215 CID.
	326 CID.
Checker Motors Corp	3.8 liter.
	4.4 liter.
Chrysler Corp	1.7 liter.
	2.2 liter.
	2.6 liter.
	3.7 liter.
	5.2 liter/2-V.
	5.2 liter/4-V.
Excalibur Motors, Ltd	305 CID.
Ford Motor Co	1.3 liter.
	1.6 liter/2C overhead cam shaft.
	2.3 liter/turbocharged.
General Motors Corp	1.6 liter.
	2.8 liter/173 CID-2V.
	3.8 liter/229 CID-2V.
	3.8 liter/231 CID-2V.
	3.8 liter/231 CID-4V turbocharged.
	4.4 liter.
	5.0/5.7 liter.
	6.0 liter/modulated displacement (M-D) (V8-6-4).
Lotus Cars, Ltd	2.0 liter.
Nissan Motor Co., Ltd	75 CID, A-series.
	85 CID, A-series.
	91 CID, A-series.
Subaru of America, Inc	1.6 liter.
	1.8 liter.
Toyo Kogyo Co., Ltd	91 CID.
	120 CID.
Toyota Motor Company, Ltd	88.6 CID.

(iii) *Oxides of nitrogen.* 1.0 grams per vehicle mile, except that: (A) Oxides of nitrogen emissions from 1981 model year light-duty vehicles manufactured by American Motors Corporation shall not exceed 2.0 grams per vehicle mile; (B) oxides of nitrogen emissions from light-duty diesel vehicles of the following 1981 model year engine families shall not exceed the prescribed levels:

Manufacturer	Engine family	Standard (gpm)
General Motors Corp	5.7 liter (L)	1.5
	1.8L	1.5
Daimler-Benz AG	2.4L	1.5
	3.0L naturally aspirated (NA).	1.5
	3.0L turbocharged (TC)	1.5
AB Volvo	2.4L-NA	1.5
Peugot	2.3L-TC-XD2S	1.5
Volkswagen AG	1.6L-NA-2250 pounds inertia weight (I.W.).	1.3
	1.6L-NA-2250 I.W	1.4
	2.0L-NA-3000 I.W	1.5
Nissan Motor Company	2.8L	1.5
Isuzu Motors, Ltd	1.8L	1.5
Vehicle Technology, Inc.	4-88 HTA	1.5
	4-92 HTA	1.5

Manufacturer	Engine family	Standard (gpm)
	5-92 HTA	1.5
	6-92 HTA	1.5

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with the procedures outlined in either § 86.109-78 or § 86.110-82.

(b)(1) Fuel evaporative emissions from 1981 and later model year gasoline-fueled light-duty vehicles shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per test.

(2) The standards set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1981 and later model year gasoline-fueled light-duty vehicle.

(d)(1) Model year 1981 light-duty vehicles sold for principal use at designated high-altitude locations shall not exceed the following exhaust emission standards when tested at the high-altitude reference point if the manufacturer of such vehicles elects to demonstrate compliance with the high-altitude emission standards.

(i) *Hydrocarbons.* 0.57 grams per vehicle mile;

(ii) *Carbon Monoxide.* 7.8 grams per vehicle mile;

(iii) *Oxides of nitrogen.* 1.0 grams per vehicle mile, except that oxides of nitrogen emissions from 1981 light-duty vehicles manufactured by American Motors Corporation shall not exceed 2.0 grams per vehicle mile.

(2) The standards set forth in paragraph (d)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures.

(e)(1) Fuel evaporative emissions from 1981 model year gasoline-fueled light-duty vehicles sold for principal use at designated high-altitude areas shall not exceed 2.6 grams per test when tested at the high-altitude reference point if the manufacturer of such vehicles elects to demonstrate compliance with the high-altitude emission standards.

(2) The standards set forth in paragraph (e)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

[51 FR 24326, July 3, 1986]

§ 86.082-2 Definitions.

(a) The definitions of this section apply to this subpart and also to Subparts B, D, and I of this part.

(b) As used in this subpart, all terms not defined herein shall have the meaning given them in the Act:

"Accuracy" means the difference between a measurement and true value.

"Act" means Part A of Title II of the Clean Air Act, 42 U.S.C. as amended, 7521, *et seq.*

"Administrator" means the Administrator of the Environmental Protection Agency or his authorized representative.

"Auxiliary Emission Control Device (AECD)" means any element of design which senses temperature, vehicle speed, engine RPM, transmission gear, manifold vaccum, or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of any part of the emission control system.

"Basic engine" means a unique combination of manufacturer, engine displacement, number of cylinders, fuel system (as distinguished by number of carburetor barrels or use of fuel injection), catalyst usage, and other engine and emission control system characteristics specified by the Administrator.

"Basic vehicle frontal area" means the area enclosed by the geometric projection of the basic vehicle along the longitudinal axis, which includes tires but excludes mirrors and air deflectors, onto a plane perpendicular to the longitudinal axis of the vehicle.

"Body style" means a level of commonality in vehicle construction as defined by number of doors and roof treatment (e.g., sedan, convertible, fastback, hatchback).

"Body type" means a name denoting a group of vehicles that are either in the same car line or in different car lines provided the only reason the vehicles qualify to be considered in different car lines is that they are produced by a separate division of a single manufacturer.

"Calibrating gas" means a gas of known concentration which is used to establish the response curve of an analyzer.

"Calibration" means the set of specifications, including tolerances, unique to a particular design version, or application of a component or components assembly capable of functionally describing its operation over its working range.

"Car line" means a name denoting a group of vehicles within a make or car division which has a degree of commonality in construction (e.g., body, chassis). Car line does not consider any level of decor or opulence and is not generally distinguished by characteristics as roofline, number of doors, seats, or windows except for station wagons or light-duty trucks. Station wagons and light-duty trucks are considered to be different car lines than passenger cars.

"Configuration" means a subclassification of an engine-system combination on the basis of engine code, inertia weight class, transmission type and gear ratios, final drive ratio, and other parameters which may be designated by the Administrator.

"Crankcase emissions" means airborne substances emitted to the atmosphere from any portion of the engine crankcase ventilation or lubrication systems.

"Curb-idle" for manual transmission code heavy-duty engines means the manufacturer's recommended engine speed with the transmission in neutral or with the clutch disengaged. For automatic transmission code heavy-duty engines, curb-idle means the manufacturer's recommended engine speed with the automatic transmission in gear and the output shaft stalled.

"Defeat Device" means an AECD that reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal urban vehicle operation and use, unless (1) such conditions are substantially included in the Federal emission test procedure, (2) the need for the AECD is justified in terms of protecting the vehicle against damage or accident, or (3) the AECD does not go beyond the requirements of engine starting.

"Diurnal breathing losses" means evaporative emissions as a result of the daily range in temperature.

"Drive train configuration" means a unique combination of engine code, transmission configuration, and axle ratio.

"Dynamometer-idle" for automatic transmission code heavy-duty engines means the manufacturer's recommended engine speed without a transmission that simulates the recommended engine speed with a transmission and with the transmission in neutral.

"Engine code" means a unique combination, within an engine-system combination, of displacement, carburetor (or fuel injection) calibration, choke calibration, distributor calibration, auxiliary emission control devices, and other engine and emission control system components specified by the Administrator.

"Engine family" means the basic classification unit of a manufacturer's product line used for the purpose of test fleet selection and determined in accordance with § 86.082-24.

"Engine family group" means a combination of engine families for the purpose of determining a minimum deterioration factor under the Alternative Durability Program.

"Engine-system combination" means an engine family-exhaust emission control system combination.

"EPA Enforcement Officer" means any officer of employee of the Environmental Protection Agency so designated in writing by the Administrator (or by his designee).

"Evaporative emission code" means a unique combination, in an evaporative emission family-evaporative emission control system combination, of purge system calibrations, fuel tank and carburetor bowl vent calibrations and other fuel system and evaporativ emission control system components and calibrations specified by the Administrator.

"Evaporative emissions" means hydrocarbons emitted into the atmosphere from a motor vehicle, other than exhaust and crankcase emissions.

"Evaporative vehicle configuration" means a unique combination of basic engine, engine code, body type, and evaporative emission code.

"Exhaust emissions" means substances emitted to the atmosphere from any opening downstream from the exhaust port of a motor vehicle engine.

"Fuel evaporative emissions" means vaporized fuel emitted into the atmosphere from the fuel system of a motor vehicle.

"Fuel system" means the combination of fuel tank(s), fuel pump, fuel lines, and carburetor or fuel injection components, and includes all fuel system vents and fuel evaporative emission control system components.

"Gross vehicle weight" means the manufacturer's gross weight rating for the individual vehicle.

"Gross vehicle weight rating (GVWR)" means the value specified by the manufacturer as the maximum design loaded weight of a single vehicle.

"Hang-up" refers to the process of hydrocarbon molecules being adsorbed, condensed, or by any other method removed from the sample flow prior to reaching the instrument detector. It also refers to any subsequent desorption of the molecules into the sample flow when they are assumed to be absent.

"Heavy-duty engine" means any engine which the engine manufacturer could reasonably expect to be used for motive power in a heavy duty vehicle.

"Heavy-duty vehicle" means any motor vehicle rated at more than 8,500 pounds GVWR or that has a vehicle curb weight of more than 6,000 pounds or that has a basic vehicle frontal area in excess of 45 square feet.

"High altitude" means any elevation over 1,219 meters (4,000 feet).

"High-altitude conditions" means a test altitude of 1,620 meters (5,315 feet), plus or minus 100 meters (328 feet), or equivalent observed barometric test conditions of 83.3±1 kilopascals.

"High-altitude reference point" means an elevation of 1,620 meters (5,315 feet) plus or minus 100 meters (328 feet), or equivalent observed barometric test conditions of 83.3 kPa (24.2 inches Hg), plus or minus 1 kPa (0.30 Hg).

"Hot-soak losses" means evaporative emissions after termination of engine operation.

"Incomplete truck" means any truck which does not have the primary load carrying device or container attached.

"Inertia weight class" means the class, which is a group of test weights, into which a vehicle is grouped based on its loaded vehicle weight in accordance with the provisions of Part 86.

"Intermediate speed" means peak torque speed if peak torque speed occurs between 60 and 75 percent of rated speed. If the peak torque speed is less than 60 percent of rated speed, intermediate speed means 60 percent of rated speed. If the peak torque speed is greater than 75 percent of rated speed, intermediate speed means 75 percent of rated speed.

"Light-duty truck" means any motor vehicle rated at 8,500 pounds GVWR or less which as a vehicle curb weight of 6,000 pounds or less and which has a basic vehicle frontal area of 45 square feet or less, which is:

(1) Designed primarily for purposes of transportation of property or is a derivation of such a vehicle, or

(2) Designed primarily for transportation of persons and has a capacity of more than 12 persons, or

(3) Available with special features enabling off-street or off-highway operation and use.

"Light-duty vehicle" means a passenger car or passenger car derivative capable of seating 12 passengers or less.

"Loaded vehicle weight" means the vehicle curb weight plus 300 pounds.

"Low altitude" means any elevation equal to or less than 1,219 meters (4,000 feet).

"Low altitude conditions" means a test altitude less than 549 meters (1,800 feet).

"Malfunction" means not operating according to specifications (e.g., those specifications listed in the application for certification).

"Maximum rated horsepower" means the maximum brake horsepower output of an engine as stated by the manufacturer in his sales and service literature and his application for certification under § 86.082-21.

"Maximum rated torque" means the maximum torque produced by an engine as stated by the manufacturer in his sales and service literature and his application for certification under § 86.082-21.

"Military engine" means any engine manufactured solely for the Department of Defense to meet military specifications.

"Model" means a specific combination of car line, body style, and drivetrain configuration.

"Model type" means a unique combination of car line, basic engine, and transmission class.

"Model year" means the manufacturer's annual production period (as determined by the Administrator) which includes January 1 of such calendar year: *Provided,* That if the manufacturer has no annual production period, the term "model year" shall mean the calendar year.

"Nominal fuel tank capacity" means the volume of the fuel tank(s), specified by the manufacturer to the nearest tenth of a U.S. gallon, which may be filled with fuel from the fuel tank filler inlet.

"Opacity" means the fraction of a beam of light, expressed in percent, which fails to penetrate a plume of smoke.

"Option" means any available equipment or feature not standard equipment on a model.

"Oxides of nitrogen" means the sum of the nitric oxide and nitrogen dioxide contained in a gas sample as if the nitric oxide were in the form of nitrogen dioxide.

"Peak torque speed" means the speed at which an engine develops maximum torque.

"Percent load" means the fraction of the maximum available torque at a specified engine speed.

"Precision" means the standard deviation of replicated measurements.

"Rated speed" means the speed at which the manufacturer specifies the maximum rated horsepower of an engine.

"Reconfigured emission-data vehicle" means an emission-data vehicle obtained by modifying a previously used emission-data vehicle to represent another emission-data vehicle.

"Running loss" means fuel evaporative emissions resulting from an average trip in an urban area or the simulation of such a trip.

"Scheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed on a periodic basis to prevent part failure or vehicle (if the engine were installed in a vehicle) malfunction.

"Smoke" means the matter in the exhaust emission which obscures the transmission of light.

"Span gas" means a gas of known concentration which is used routinely to set the output level of an analyzer.

"Standard equipment" means those features or equipment which are marketed on a vehicle over which the purchaser can exercise no choice.

"System" includes any motor vehicle engine modification which controls or causes the reduction of substances emitted from motor vehicles.

"Tank fuel volume" means the volume of fuel in the fuel tank(s) which is determined by taking the manufacturer's nominal fuel tank(s) capacity and multiplying by 0.40, the result being rounded using ASTM E 29-67 to the nearest tenth of a U.S. gallon.

"Test weight" means the weight within an inertia weight class, which is used in the dynamometer testing of a vehicle, and which is based on its loaded vehicle weight in accordance with the provisions of Part 86.

"Throttle" means the mechanical linkage which either directly or indirectly controls the fuel flow to the engine.

"Transmission class" means the basic type of transmission, e.g., manual, automatic, semiautomatic.

"Transmission configuration" means a unique combination, within a transmission class, of the number of th forward gears and, if applicable, overdrive. The Administrator may further subdivide a transmission configuration (based on such criteria as gear ratios, torque convertor multiplication ratio, stall speed and shift calibration, etc.), if he determines that significant fuel economy or exhaust emission differences exist within that transmission configuration.

"Unscheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed to correct a part failure or vehicle (if the engine were installed in a vehicle) malfunction.

"Useful life" means:

(1) For light-duty vehicles and light-duty trucks a period of use of 5 years or 50,000 miles, whichever first occurs.

(2) For gasoline-fueled heavy-duty engines a period of use of 5 years or 50,000 miles of vehicle operation or 1,500 hours of engine operation (or an equivalent period of 1,500 hours of dynamometer operation), whichever first occurs.

(3) For diesel heavy-duty engines a period of use of 5 years or 100,000 miles of vehicle operation or 3,000 hours of engine operation (or an equivalent period of 1,000 hours of dynamometer operation), whichever first occurs.

"Van" means a light-duty truck having an integral enclosure, fully enclosing the driver compartment and load carrying device, and having no body sections protruding more than 30 inches ahead of the leading edge of the windshield.

"Vehicle configuration" means a unique combination of basic engine, engine code, inertia weight class, transmission configuration, and axle ratio.

"Vehicle curb weight" means the actual or the manufacturer's estimated weight of the vehicle in operational status with all standard equipment, and weight of fuel at nominal tank capacity, and the weight of optional equipment computed in accordance with § 86.082-24; incomplete light-duty trucks shall have the curb weight specified by the manufacturer.

"Zero (0) hours" means that point after normal assembly line operations and adjustments are completed and before ten (10) additional operating hours have been accumulated, including emission testing, if performed.

"Zero (0) miles" means that point after initial engine starting (not to exceed 100 miles of vehicle operation, or three hours of engine operation) at which normal assembly line operations and adjustments are completed, and including emission testing, if performed.

[46 FR 50475, Oct. 13, 1981, and 47 FR 49807, 49808, Nov. 2, 1982]

§ 86.082-8 Emissions standards for 1982 and later light-duty vehicles.

(a)(1) The standards set forth in paragraphs (a) through (c) of this section shall apply for vehicles sold for principal use at other than designated high-altitude locations. Exhaust emissions from 1982 and later model year light-duty vehicles shall not exceed:

(i) *Hydrocarbons.* 0.41 grams per vehicle mile (0.255 grams per vehicle kilometer);

(ii) *Carbon monoxide.* 3.4 grams per vehicle mile (2.11 grams per vehicle kilometer), except that carbon monoxide emissions from light-duty vehicles of the following 1982 model year engine families shall not exceed 7.0 grams per vehicle mile (4.35 grams per vehicle kilometer):

Manufacturer	Engine family
Avanti Motor Corp	5.0 liter
American Motors Corp	151 CID.
	258 CID.
BL Cars, Ltd	215 CID.
	326 CID.
	4.2 liter/fuel injected.
Chrysler Corp	1.6 liter.
	1.7 liter.
	2.2 liter.
	2.6 liter.
	3.7 liter.
	5.2 liter/2-V.
	5.2 liter/4-V.
Excalibur Motor, Ltd	305 CID.
Ford Motor Co	1.6 liter/2V overhead camshaft.
	2.3 liter.
	2.3 liter/turbocharged.
	3.3 liter.
	3.8 liter V-6.
	4.2/5.0 liter.
	5.8 liter.
General Motors Corp	1.6 liter.
	1.8/2.0 liter.
	1.8 liter/fuel injected.

Manufacturer	Engine family
	2.5 liter/throttle body fuel injected.
	2.8 liter/173 CID-2V.
	3.0/3.8 liter/231 CID-2V.
	3.8 liter/turbocharged.
	3.8 liter/229 CID-2V.
	4.1 liter/fuel injected.
	4.4 liter.
	5.0/5.7 liter/fuel injected.
	5.0/5.7 liter.
Lotus Cars, Ltd	2.0 liter.
	2.2 liter.
	2.2 liter/turbocharged.
	4.0 liter.
Nissan Motor Co., Ltd	75 CID A-series.
	85 CID A-series.
	91 CID A-series.
Subaru of America, Inc	1.6 liter.
	1.8 liter.
Toyota Motor Co., Ltd	88.6 CID.
Volkswagen of America	1.7 liter/feed back carburetor.

(iii) Oxides of nitrogen-1.0 grams per vehicle mile, except that: (A) Oxides of nitrogen emissions from 1982 model year light-duty vehicles manufactured by American Motors Corporation shall not exceed 2.0 grams per vehicle mile; (B) oxides of nitrogen emissions from light-duty diesel vehicles of the following 1982 and later model year engine families shall not exceed the prescribed levels:

Manufacturer and engine family	Model years	Standard (g/mi)
Isuzu Motors Ltd,: 1.8L	1982, 1983, 1984	1.5
Renault 2.0L	1982, 1983, 1984	1.5
BL Cars Ltd.:		
2.4L-TC	1983, 1984	1.5
3.6L-TC	1983, 1984	1.5
Chrysler Corp.: 1.9L-NA	1984	1.5
Ford Motor Company:		
2.4L-TC	1984	1.5
TX1	1984	1.5
BMW: 2.4L-TC	1984	1.5
Vehicle Technology, Inc.:		
4-88 HTA	1982, 1983	1.5
4-92 HTA	1982, 1983	1.5
5-92 HTA	1982, 1983	1.5
6-92 HTA	1982, 1983	1.5
Toyo Kogyo Co., Ltd.: TXI	1984	1.5
American Motors Corp.: 1.6L	1984	1.5
Toyota Motor Corp.:		
1.8L-NA	1984	1.5
1.8L-TC	1984	1.5
General Motors Corp:		
1.8L Liter (L)	1982, 1983, 1984	1.5
4.3L	1982, 1983, 1984	1.5
5.7L	1982, 1983, 1984	1.5
EF-C	1983, 1984	1.5
Daimler-Benz AG:		
2.0L	1984	1.5
2.4L-Naturally aspirated (NA)	1982, 1983, 1984	1.25
3.0L-NA	1982	1.5
3.0L-turbocharge (TC)	1982, 1983, 1984	1.5
AB Volvo:		
2.4L-NA	1982, 1983, 1984	1.5
2.4L-TC	1983, 1984	1.5
Peugeot:		
2.3L-TC-XD2S	1982	1.5
XD2S/XD3S-TC	1983, 1984	1.5
2.3L-NA-XD2C	1982, 1983	1.5
1.9L-NA-XUD9	1983, 1984	1.5
Revere Classics: R.C. 300	1982, 1983, 1984	1.5
Volkswagen AG:		
1.6L-NA-2250 pound inertia weight class I.W.	1982, 1983, 1984	1.5
1.6L-TC-2250 I.W.	1982, 1983, 1984	1.5
1.6L-TC-2500 and 2750 I.W.	1982, 1983, 1984	1.5
1.6L-TC-2500 and 2750 I.W.	1982, 1983, 1984	1.5
2.0L-NA	1982, 1983, 1984	1.5
2.0L-TC	1982, 1983, 1984	1.5
Nissan Motor Company:		
2.8L	1982, 1983	1.5
XM1	1983, 1984	1.5

(iv) Particulate emissions (diesels only). 0.60 gram per vehicle mile (0.373 gram per vehicle kilometer).

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures.

(b)(1) Fuel evaporative emissions from 1982 and later model year gasoline-fueled light-duty vehicles shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per test.

(2) The standards set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in a Subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1982 and later model year gasoline-fueled light-duty vehicle.

(d)(1) Model year 1982 and later light-duty vehicles sold for principal use at a designated high-altitude location shall be capable of meeting the following exhaust emission standards when tested under high-altitude conditions.

(i) *Hydrocarbons.* 0.57 grams per vehicle mile (0.35 grams per vehicle kilometer).

(ii) *Carbon monoxide.* 7.8 grams per vehicle mile (4.8 grams per vehicle kilometer), except that carbon monoxide emissions from 1982 model year light-duty vehicles which are specifically listed in paragraph (a)(1)(ii) of this section shall not exceed 11 grams per vehicle mile (6.8 grams per vehicle kilometer).

(iii) *Oxides of nitrogen.* The standards in paragraph (a)(1)(iii) of this section apply.

(2) The standards set forth in paragraph (d)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part measured and calculated in accordance with those procedures.

(e)(1) Fuel evaporative emissions from 1982 and later model year gasoline-fueled light-duty vehicles sold for principal use at designated high-altitude locations shall not exceed 2.6 grams per test when tested under high-altitude conditions.

(2) The standards set forth in paragraph (e)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(f) No crankcase emissions shall be discharged into the ambient atmosphere from any 1982 and later model year gasoline-fueled light-duty vehicles sold for principal use at designated high-altitude locations.

(g)(1) Any light-duty vehicle that a manufacturer wishes to certify for sale at low altitude must also be capable of meeting high-altitude emissions standards (specified in paragraphs (d) through (f) of this section). The manufacturer may specify vehicle adjustments or modifications to allow the vehicle to meet high-altitude standards but these adjustments or modifications may not alter the vehicle's basic engine, inertia weight class, transmission configuration, and axle ratio.

(i) A manufacturer may certify unique vehicle configurations to meet the high-altitude standards but is not required to certify these vehicle configurations to meet the low-altitude standards.

(ii) Any adjustments or modifications that are recommended to be performed on vehicles to satisfy the requirements of paragraph (g)(1) of this section:

(A) Shall be capable of being effectively performed by commercial repair facilities.

(B) Must be included in the manufacturer's application for certification.

(2) The manufacturer may exempt vehicles from the high-altitude emission standards as set forth in paragraph (d) of this section if the vehicles are not intended for sale at high altitude and if the vehicles fall within the definition of vehicles eligible for exemption. A vehicle shall be considered eligible for exemption if its design parameters [displacement-to-weight ratio (D/W) and engine speed-to-vehicle speed (N/V)] simultaneously fall within the exempted range for that manufacturer for that year. The exempted range is determined according to the following procedure:

(i) The manufacturer shall graphically display the D/W and N/V data of all vehicle configurations it will offer for the model year in question. The axis of the abscissa shall be D/W (where (D) is the engine displacement expressed in cubic centimeters and (W) is the equivalent vehicle test weight expressed in pounds), and the axis of the ordinate shall be N/V (where (N) is the crankshaft speed expressed in revolutions per minute and (V) is the vehicle speed expressed in miles per hour). At the manufacturer's option, either the 1:1 transmission gear ratio or the lowest numerical gear ratio available in the transmission will be used to determine N/V. The gear selection must be the same for all N/V data points on the manufacturer's graph. For each transmission/axle ratio combination, only the lowest N/V value shall be used in the graphical display.

(ii) The product line is then defined by the equation, $N/V=C(D/W)^{-0.9}$, where the constant, (C), is determined by the requirement that all the vehicle data points either fall on the line or line to upper right of the line as displayed on the graphs.

(iii) The exemption line is then defined by the equation, $N/V=C(0.84D/W)^{-0.9}$, where the constant, (C), is the same as that found paragraph (g)(2)(ii) of this section.

(iv) The exempted range includes all values of N/V and D/W which simultaneously fall to lower left of the exemption line as drawn on the graph.

(3) The sale of a vehicle for principal use at a designated high-altitude location that has been exempted as set forth in paragraph (g)(2) of this section will be considered as violation of section 203(a)(1) of the Clean Air Act.

[51 FR 24327, July 3, 1986]

§ 86.082-14 Small-volume manufacturers certification procedures.

(a) The small-volume manufacturers certification procedures described in paragraphs (b) and (c) of this section are optional. Small-volume manufacturers may use these optional procedures to demonstrate compliance with the general standards and specific emission requirements contained in this subpart.

(b)(1) The optional small-volume manufacturers certification procedures apply to light-duty vehicles, light-duty trucks, and heavy-duty engines produced by manufacturers with U.S. sales (for the model year in which certification is sought) of fewer than 10,000 units (LDV, LDT and HDE combined).

(2) For the purpose of determining the applicability of paragraph (b)(1) of this section, where there is more than one importer or distributor of vehicles and/or engines manufactured by the same person, the sales the Administrator shall use shall be the aggregate of the projected or actual sales of those vehicles and/or engines by all of the importers and distributors.

(c) Small-volume manufacturers shall demonstrate compliance with the applicable sections of this subpart as follows:

(1) Sections 86.082-1 through 86.082-11 of this subpart are applicable.

(2) Section 86.082-12 of this subpart is not applicable.

(3) Sections 86.082-13 through 86.082-20 of this subpart are applicable.

(4) Section 86.082-21. Small-volume manufacturers are covered by the following:

(i) The manufacturer shall include in its records all of the information that EPA requires in § 86.082-21 of this subpart. This information will be considered part of the manufacturer's application for certification. However, the manufacturer is not required to submit the information to the Administrator unless the Administrator requests it.

(5) Section 86.082-22 is applicable except as noted below.

(i) Small-volume light-duty vehicle and light-duty truck manufacturers may satisfy the requirements of § 86.082-22(e) by including a statement of compliance on adjustable parameters in the application for certification. In the statement of compliance the manufacturer shall state that the limits, stops, seals, or other means used to inhibit adjustment have been designed to accomplish their intended purpose based on good engineering practice and past experience. If the vehicle parameter is adjustable the vehicle must meet emission standards with the parameter set any place within the adjustable range (Reference § 86.081-21).

(ii) Paragraphs (a), (b), (c), and (d) of § 86.082-22 are not applicable.

(6) Section 86.082-23 is applicable except that small-volume light-duty vehicle manufacturers may test emission-data vehicles at any service accumulation distance less than the 6,436-kilometer (4,000-mile) test point. Small-volume heavy-duty manufacturers may provide compliance emission data at less than 125 hours of operation instead of the 125-hour test point.

(7) Section 86.082-24 of this subpart is applicable except as noted below.

(i) Small-volume manufacturers may satisfy the requirements of paragraphs (b) and (c) of § 86.082-24 by:

(A) Selecting emission-data test vehicles (engines) by the worst-case emissions criteria as follows:

(*1*) *Light-duty vehicles and light-duty trucks.* The test vehicle shall be selected based on the following criteria: The manufacturer shall select the heaviest (including options) vehicle within the family. Then within that vehicle it shall select, in the order listed, the largest frontal area, largest displacement, the highest numerical axle ratio with the largest tire offered in the engine family, and the maximum fuel flow calibration.

(*2*) *Heavy-duty gasoline fueled engines.* The manufacturer shall select the worst case emission-data engine first based on the largest displacement within the engine family. Then within the largest displacement the manufacturer shall select, in the order listed, highest fuel flow per stroke at the speed of maximum rated torque, the engine with the most advanced spark timing, no EGR or lowest EGR flow, and no air pump or lowest actual flow air pump.

(*3*) *Heavy-duty diesel engines.* The manufacturer shall select the worst case emission data engine based on the highest fuel feed per stroke, primarily at the speed of maximum rated torque and secondarily at rated speed.

(B) Using assigned deterioration factors that the Administrator determines and prescribes. However, the manufacturer may, at its option, accumulate miles (hours) on a durability-data vehicle (engine) and complete emission tests for the purpose of establishing its own deterioration factor.

(ii) Paragraphs (d) and (e) of § 86.082-24 are not applicable.

(8) Section 86.082-25 of this subpart is applicable to durability-data light-duty vehicles, light-duty trucks, and heavy-duty engines if the manufacturer does not use assigned deterioration factors.

(9) Sections 86.082-26 and 86.082-27 of this subpart are not applicable.

(10) Sections 86.082-28 and 86.082-29 of this subpart are applicable.

(11)(i) Section 86.082-30 of this subpart is applicable, except for paragraphs (a)(2) and (b) of that section. In the place of these paragraphs, small-volume manufacturers shall comply with paragraphs (c)(11)(ii) through (11)(v) of this section, as shown below.

(ii) Small-volume manufacturers shall submit an application for certification containing the following:

(A) The names, addresses, and telephone numbers of the persons the manufacturer authorizes to communicate with us.

(B) A brief description of the vehicles (or engines) covered by the certificate (the manufacturers' sales data book or advertising, including specifications, may satisfy this requirement for most manufacturers). The description shall include, as a minimum, the following items as applicable:

(*1*) Engine families and vehicles (or engine) configurations.

(*2*) Vehicle or engine models to be listed on the certificate of conformity.

(*3*) The test weight and horsepower setting for each vehicle or engine configuration.

(*4*) Projected sales.

(*5*) Combustion cycle.

(*6*) Cooling mechanism.

(*7*) Number of cylinders.

(*8*) Displacement.

(*9*) Fuel system type.

(*10*) Number of catalytic converters, volume, and composition.

(*11*) Method of air aspiration.

(*12*) Thermal reactor characteristics.

(*13*) Suppliers' and/or manufacturer's name and model number of any emission related items of the above, items if purchased from a supplier who uses the items in its own certified vehicles(s) or engine(s).

(*14*) A List of emission component part numbers.

(*15*) Drawings, calibration curves, and descriptions of emission related components, including those components regulated under § 86.082-22(e) of this subpart, and schematics of hoses and other devices connecting these components.

(*16*) Vehicle adjustments or modifications necessary for light-duty vehicles and light-duty trucks, to assure that they conform to high-altitude standards.

(*17*) A description of the light-duty vehicles and 1982 model year light-duty trucks which are exempted from the high-altitude emission standards.

(C) The results of all emission tests the manufacturer performs.

(D)(*1*) The following statement signed by the authorized representative of the manufacturer: "The vehicles (or engines) described herein have been tested in accordance with the [list of the applicable subparts; A, B, D, or I] of Part 86, Title 40, United States Code of Federal Regulations, and on the basis of those tests are in conformance with that subpart. All of the data and records required by that subpart are on file and are available for inspection by the EPA Administrator. We project the total U.S. sales of vehicles (engines) subject to this subpart to be fewer than 10,000 units."

(*2*) A statement as required by and contained in § 86.081-14(c)(5) of this subpart signed by the authorized representative of the manufacturer.

(*3*) A statement that the vehicles or engines described in the manufacturers application for certification are not equipped with auxiliary emission control devices which can be classified as a defeat device as defined in § 86.082-2 of this subpart.

(*4*) A statement of compliance with section 206(a)(3) of the Clean Air Act.

(*5*) A statement that based on the manufacturers engineering evaluation and/or emission testing the vehicles sold for principle use at designated high-altitude locations comply with the high-altitude emission requirements and that all other vehicles are at least capable of being modified to meet high-altitude standards unless exempt under § 86.082-8(g)(2) and § 86.082-9(g)(2).

(iii) If the manufacturer meets requirements of this subpart, the Administrator will issue a certificate of conformity for the vehicles described in the application for certification.

(iv) The certificate will be issued for such a period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any vehicle or engine covered by the certificate will meet the requirements of the Act and of this subpart.

(v)(A) If, after a review of the statements and descriptions submitted by the manufacturer, the Administrator determines that the manufacturer has not met the applicable requirements, the Administrator shall notify the manufacturer in writing, setting forth the basis for his determination. The manufacturer may request a hearing on the Administrator's determination.

(B) If the manufacturer does not request a hearing or present the required information the Administrator will deny certification.

(12) Sections 86.082-31 through 86.082-32 of this subpart are not applicable.

(13) Section 86.082-33. Small-volume manufacturers are covered by the following:

(i) Small-volume manufacturers may make production changes (running changes) without receiving the Administrator's prior approval. The manufacturer shall assure (by conducting emission tests as it deems necessary) that the affected vehicles (engines) remain in compliance with the requirements of this part.

(ii) The manufacturer shall notify the Administrator within seven days after implementing any production related change (running change) that would affect vehicle emissions. This notification shall include any changes to the information required under paragraph (c)(11)(ii) of this section. The manufacturer shall also amend as necessary its records required under paragraph (c)(4) of this section to conform with the production design change.

(14) Section 86.082-34 of this subpart is not applicable.

(15) Sections 86.082-35 through 86.082-39 of this subpart are applicable.

[46 FR 16266, Mar. 12, 1981, as amended at 47 FR 49808, Nov. 2, 1982]

§ 86.082-34 Alternative procedure for notification of additions and changes.

(a) A manufacturer may, in lieu of notifying the Administrator in advance of an addition of a vehicle (or engine) under § 86.079-32 or a change in a vehicle (or engine) under § 86.079-33, notify the Administrator concurrently with making an addition of a vehicle or a change in a vehicle, if the manufacturer determines that following the change all vehicles (or engines) effected by the addition or change will still meet the applicable emission standards. Such notification shall include a full description of the addition or change and any supporting documentation the manufacturer may desire to include to support the manufacturer's determination. The manufacturer's determination that the addition or change does not cause noncompliance shall be based on an engineering evaluation of the addition or change and/or testing.

(b) The Administrator may require that additional emission testing be performed to support the manufacturers original determination submitted in paragraph (a) of this section. If additional testing is required the Administrator shall proceed as in § 86.079-32 (b) and (c) or § 86.079-33 (b) and (c) as appropriate. Additional test data, if requested, must be provided within 30 days of the request or the manufacturer must rescind the addition or change immediately. The Administrator may grant additional time to complete testing. If based on this additional testing or any other information, the Administrator determines that the vehicles effected by the addition or change do not meet the applicable standards the Administrator will notify the manufacturer to rescind the addition or change immediately upon receipt of the notification.

(c) Election to produce vehicles (or engines) under this section will be deemed to be a consent to recall all vehicles (or engines) which the Administrator determines under § 86.079-32(c) do not meet applicable standards, and to cause such nonconformity to be remedied at no expense to the owner.

[46 FR 50486, Oct. 13, 1981, and 47 FR 49807, Nov. 2, 1982]

§ 86.083-30 Certification.

(a)(1) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 86.078-7(c), and any other pertinent data or information, the Administrator determines that a test vehicle(s) or test engine(s) meet(s) the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such vehicle(s) or engine(s) except in cases covered by paragraph (c) of this section.

(i) Each certificate of conformity shall state the altitude(s) at which the vehicle(s) covered by the certificate has demonstrated compliance with the applicable emission standards.

(2) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any new motor vehicle (or new motor vehicle engine) covered by the certificate will meet the requirements of the Act and of this part.

(3) One such certificate will be issued for each engine family. For gasoline-fueled light-duty vehicles and light-duty trucks, one such certificate will be issued for each engine family-evaporative emission family combination. Each certificate will certify compliance with no more than one set of standards except for low-altitude standards and high-altitude standards. The certificate shall cover vehicles sold or delivered to an ultimate purchaser for principal use at a designated high-altitude location only if the vehicle conforms in all material respects to the design specification that applied to those vehicles described in the application for certification at high altitude.

(4) The adjustment or modification of any light-duty vehicle or light-duty truck in accordance with instructions provided by the manufacturer as approved by EPA for the altitude where the vehicle is prinicpally used will not be considered a violation of section 203(a)(3) of the Clean Air Act.

(i) A violation of section 203(a)(1) of the Clean Air Act occurs, except as provided for in § 86.083-9(g)(3), when any manufacturer sells or delivers to an ultimate purchaser any light-duty vehicle or light-duty truck, subject to the regulations under the Act, which is not configured to meet high-altitude requirements:

(A) At a designated high-altitude location unless such manufacturer has reason to believe that such motor vehicle will not be sold to an ultimate purchaser for principal use at a designated high-altitude location; or

(B) At a location other than a designated high-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated high-altitude location.

(ii) A manufacturer shall be deemed to have reason to believe that a motor vehicle which is not configured to meet high-altitude requirements will not be sold to an ultimate purchaser for principal use at a designated high-altitude location if the manufacturer has informed its dealers and field representatives about the terms of these high-altitude regulations has not caused the improper sale itself, and has taken reasonable action which shall include, but not be limited to, either paragraph (a)(4)(ii)(A) or (B), and (C) of the following:

(A) Requiring dealers in designated high-altitude locations to submit written statements to the manufacturer signed by the ultimate purchaser that a motor vehicle which is not configured to meet-high altitude requirements will not be used principally at a designated high-altitude location; requiring dealers in counties contiguous to designated high-altitude locations to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a motor vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location; and for each sale or delivery of fleets of 10 or more such vehicles in a high-altitude location or in counties contiguous to high-altitude locations, requiring either the selling dealer or the delivering dealer to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location. In addition, the manufacturer will make available to EPA, upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold), sales, warrantly, or other information pertaining to sales of vehicles by the dealers described above maintained by the manufacturer in the normal course of business relating to the altitude configuration of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of low-altitude vehicles by high-altitude dealers, or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser for principal use at a designated high-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a State or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser residing in a designated high-altitude location, or based on information obtained pursuant to paragraph (a)(4)(ii) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and, where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet high-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(5)(i) For the purpose of paragraph (a) of this section, a "designated high-altitude location" is any county which has substantially all of its area located above 1,219 meters (4,000 feet) and:

(A) Requested an extension past the attainment date of December 31, 1982 for compliance with either the National Ambient Air Quality Standards for carbon monoxide or ozone, as indicated in Part 52 (Approval and Promulgation of Implementation Plans) of this title; or

(B) Is in the same state as a county designated as a high-altitude location according to paragraph (a)(5)(i) of this section.

(ii) The designated high-altitude locations defined in paragraph (a)(5)(i)(A) of this section are listed below:

DESIGNATED HIGH-ALTITUDE LOCATIONS (COUNTIES)

STATE OF COLORADO

Adams
Alamosa
Arapahoe
Archuleta
Boulder
Chaffee
Cheyenne
Clear Creek
Conejos
Costilla
Crowley
Custer
Delta
Denver
Dolores
Douglas
Eagle
Elbert
El Paso
Fremont
Garfield
Gilpin
Grand
Gunnison
Hinsdale
Huerfano
Jackson
Jefferson
Kit Carson
Lake
La Plata
Larimer
Las Animas
Lincoln
Mesa
Mineral
Moffat
Montezuma
Montrose
Morgan
Otero
Ouray
Park
Pitkin
Pueblo
Rio Blanco
Rio Grande
Routt
Saguache
San Juan
San Miguel
Summit
Teller
Washington
Weld

STATE OF NEVADA

Carson City
Douglas
Elko
Esmeralda
Eureka
Humboldt
Lander
Lincoln
Lyon
Mineral
Nye
Pershing
Storey
Washoe
White Pine

STATE OF NEW MEXICO

Bernalillo
Catron
Colfax
Curry
De Baca
Grant
Guadalupe
Harding
Hidalgo
Lincoln
Los Alamos
Luna
McKinley
Otero
Mora
Rio Arriba
Roosevelt
Sandoval
San Juan
San Miguel
Santa Fe
Sierra
Socorro
Taos
Torrance
Union
Valencia

STATE OF UTAH

Beaver
Box Elder
Cache
Carbon
Daggett
Davis
Duchesne
Emery
Garfield
Grand
Iron
Juab
Kane
Millard
Morgan
Piute
Rich
Salt Lake
San Juan
Sanpete
Sevier
Summit
Tooele
Uintah
Utah
Wasatch
Wayne
Weber

(6) The provisions of paragraph (a)(4) of this section shall not apply to any light-duty vehicle or light-duty truck sold, offered for sale, introduced, or delivered for introduction into commerce in California provided that the vehicle is covered by a certificate of conformity with emission standards in effect in California.

(7) Catalyst-equipped vehicles, otherwise covered by a certificate which are driven outside the United States, Canada, and Mexico will be presumed to have been operated on leaded gasoline resulting in deactivation of the catalysts. If these vehicles are imported or offered for the importation without retrofit of the catalyst, they will be considered not to be within the coverage of the certificate unless included in a catalyst control program operated by a manufacturer or a United States Government Agency and approved by the Administrator.

(8) For incomplete light-duty trucks, a certificate covers only those new motor vehicles which, when completed by having the primary load-carrying device or container attached, conform to the maximum curb weight and frontal area limitations described in the application for certification as required in § 86.082-21(d).

(9) For heavy-duty engines, a certificate covers only those new motor vehicle engines installed in heavy-duty vehicles which conform to the minimum gross vehicle weight rating, curb weight, or frontal area limitations for heavy-duty vehicles described in § 86.082-2.

(b)(1) The Administrator will determine whether a vehicle (or engine) covered by the application complies with applicable standards by observing the following relationships:

(i) *Light-duty vehicles and Light-duty trucks.* (A) The durability-data vehicle(s) selected under § 86.082-24(c)(1)(i) shall represent all vehicles of the same engine-system combination.

(B) The emission-data vehicles(s) selected under § 86.082-24(b)(1)(ii) through (b)(1)(v) shall represent all vehicles of the same engine-system combination as applicable.

(C) The emission-data vehicle(s) selected under § 86.082-24(b)(1)(vii) shall represent all vehicles of the same evaporative control system within the evaporative emission family, as applicable.

(D) The emission-data vehicle(s) selected under § 86.082-24(b)(1)(v) shall represent all vehicles of the same engine-system combination to be sold at high altitude.

(E) The emission-data vehicle(s) selected under § 86.082-24(b)(1)(vii) (D) shall represent all vehicles of the same evaporative control system within the evaporative family sold at high altitude.

(ii)(A) *Gasoline-fueled heavy-duty engines.* A test engine selected under § 86.082-24(b)(2)(ii) and (iv) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(B) A test engine selected under § 86.082-24(b)(2)(iii) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(C) A test engine selected under § 86.082-24(c)(2)(i) shall represent all engines of the same engine-system combination.

(iii)(A) *Diesel heavy-duty engines.* A test engine selected under § 86.082-24(b)(3)(ii) shall represent all engines in the same engine-system combination.

(B) A test engine selected under § 86.082-24(b)(3)(iii) shall represent all engines of that emission control system at the rated fuel delivery of the test engines.

(C) A test engine selected under § 86.082-24(c)(3)(i) shall represent all engines of the same engine-system combination.

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the vehicles (or engines) belonging to an engine family or engine family-evaporative emission family combination (as applicable), all of which comply with all applicable standards.

(3) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to § 86.079-29, data or information derived from any inspection carried out under § 86.078-7(c) or any other pertinent data or information, the Administrator determines that one or more test vehicles (or test engines) of the certification test fleet do not meet applicable standards, he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078-6 with respect to such issue.

(4) For light-duty vehicles and light-duty trucks the manufacturer may, at his option, proceed with any of the following alternatives with respect to an emission-data vehicle determined not in compliance with all applicable standards for which it was tested:

(i) Request a hearing under § 86.078-6; or

(ii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed, from his application;

(A) If the failed vehicle was tested for compliance with exhaust emission standards only: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data ve hicle to be tested for exhaust emission compliance only.

(B) If the failed vehicle was tested for compliance with both exhaust and evaporative emission standards: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle which will be tested for compliance with both exhaust and evaporative emission standards. If one vehicle cannot be selected in accordance with the selection criteria employed in selecting the failed vehicle, then two vehicles may be selected (i.e., one vehicle to satisfy the exhaust emission vehicle selection criteria and one vehicle to satisfy the evaporative emission vehicle selection criteria). The vehicle selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards only. The vehicle selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards; or

(iii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed from the application and add a vehicle configuration(s) (or evaporative vehicle configuration(s), as applicable) not previously listed. The Administrator may require, if applicable, that the failed vehicle be modified to the new engine code (or evaporative emission code, as applicable) and demonstrate by testing that it meets applicable standards for which it was originally tested. In addition, the Administrator may select, in accordance with the vehicle selection criteria given in § 86.082-24(b), a new emission-data vehicle or vehicles. The vehicles selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards only. The vehicles selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards; or

(iv) Correct a component or system malfunction and show that with a correctly functioning system or component the failed vehicle meets applicable standards for which it was originally tested. The Administrator may require a new emission-data vehicle, of identical vehicle configuration (or evaporative vehicle configuration, as applicable) to the failed vehicle, to be operated and tested for compliance with the applicable standards for which the failed vehicle was originally tested.

(5) For heavy-duty engines the manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test engine(s) determined not in compliance with applicable standards:

(i) Request a hearing under § 86.078-6; or

(ii) Delete from the application for certification the engines represented by the failing test engine. (Engines so deleted may be included in a later request for certification under § 86.079-32.) The Administrator may then select in place of each failing engine an alternate engine chosen in accordance with selection criteria employed in selecting the engine that failed; or

(iii) Modify the test engine and demonstrate by testing that it meets applicable standards. Another engine, which is in all material respects the same as the first engine, as modified, may then be operated and tested in accordance with applicable test procedures.

(6) If the manufacturer does not request a hearing or present the required data under paragraph (b)(4) or (b)(5) (as applicable) of this section, the Administrator will deny certification.

(c)(1) Notwithstanding the fact that any certification vehicle(s) (or certification engine(s)) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such vehicle(s) (or engine(s)) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof;

(ii) The manufacturer renders inaccurate any test data which he submits pertaining thereto or otherwise circumvents the intent of the Act, or of this part with respect to such vehicle (or engine);

(iii) Any EPA Enforcement Officer is denied access on the terms specified in § 86.078-7(c) to any facility or portion thereof which contains any of the following:

(A) The vehicle (or engine);

(B) Any components used or considered for use in its modification or buildup into a certification vehicle (or certification engine);

(C) Any production vehicle (or production engine) which is or will be claimed by the manufacturer to be covered by the certificate;

(D) Any step in the construction of a vehicle (or engine) described in paragraph (c)(1)(iii)(C) of this section;

(E) Any records, documents, reports, or histories required by this part to be kept concerning any of the above;

(iv) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 86.078-7(c)) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(2) The sanctions of withholding, denying, revoking, or suspending a certificate may be imposed for the reasons in paragaph (c)(1) (i), (ii), (iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void ab initio.

(4) In any case in which certification of a vehicle (or engine) is proposed to be withheld, denied, revoked, or suspended under paragraph (c)(1)(iii) or (c)(1)(iv) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.078-7(c) in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle (or engine) in question was not involved in the violation to a degree that would warrant withholding denial, revocation, or suspension of certification under either paragraph (c)(1)(iii) or (c)(1)(iv) of this section shall have the burden of establishing that contention to the satisfaction of the Administrator.

(5) Any revocation of suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.078-6 hereof.

(ii) Extend no further than to forbid the introduction into commerce of vehicles (or engines) previously covered by the certification which are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes the certification invalid ab initio.

(6) The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Administrator under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with § 86.078-6. If the Administrator finds, after a review of the request and supporting data, that the request raises a substantial factual issue, he will grant the request with respect to such issue.

(d)(1) Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.603; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.603; or

(iii) The manufacturer submits false or incomplete information in any report of information provided pursuant to the requirement of § 86.609; or

(iv) The manufacturer renders inaccurate any test data which he submits pursuant to the requirements of § 86.609; or

(v) Any EPA Enforcement Officer is denied access to a facility on the terms specified in § 86.606; or

(vi) Any EPA Enforcement Officer is denied the opportunity on the terms specified in § 86.606, to:

(A) Monitor vehicle selection pursuant to § 86.607, or

(B) Select vehicles for testing pursuant to § 86.607, or

(C) Monitor vehicle testing performed to satisfy any of the requirements of this part; or

(vii) Any EPA Enforcement Officer is denied "reasonable assistance" as defined in § 86.606 in examining any of the items listed in that section; or

(viii) The manufacturer refuses to comply with the requirements of §§ 86.604(a), 86.605, and 86.607, 86.608, 86.610, or § 86.611.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraph (d)(1)(i), (ii), or (viii) of this section where such refusal is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but not be limited to, any uncontrollable factors which results in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturer to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanctions of suspending a certificate may be imposed for the reasons in paragraph (d)(1) (iii), (iv), (v), (vi), or (vii) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a vehicle is proposed to be suspended under paragraph (d)(1)(v), (d)(1)(vi), or (d)(1)(vii) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.606 in fact occurred, the manufacturer, if he wishes to contend that even though the violation occurred, the vehicle configuration or engine family in question was not involved in the violation to the degree that would warrant suspension of certification under either paragraph (d)(1)(v), (d)(1)(vi), or (d)(1)(vii) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (d)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.613 hereof, and

(ii) Not apply to vehicles no longer in the hands of the manufacturer.

(Approved by the Office of Management and Budget under control number 2060-0049)

[48 FR 41305, Sept. 15, 1983, as amended at 50 FR 4514, Jan. 31, 1985]

§ 86.084-2 Definitions.

The definitions in § 86.082-2 remain effective. The definitions listed in this section apply beginning with the 1984 model year.

"Approach angle" means the smallest angle in a plan side view of an automobile, formed by the level surface on which the automobile is standing and a line tangent to the front tire static loaded radius arc and touching the underside of the automobile forward of the front tire.

"Axle clearance" means the vertical distance from the level surface on which an automobile is standing to the lowest point on the axle differential of the automobile.

"Breakover angle" means the supplement of the largest angle, in the plan side view of an automobile, that can be formed by two lines tangent to the front and rear static loaded radii arcs and intersecting at a point on the underside of the automobile.

"Curb-idle" means:

(1) For manual transmission code light-duty trucks, the engine speed with the transmission in neutral or with the clutch disengaged and with the air conditioning system, if present, turned off. For automatic transmission code light-duty trucks, curb-idle means the engine speed with the automatic transmission in the Park position (or Neutral position if there is no Park position), and with the air conditioning system, if present, turned off.

(2) For manual transmission code heavy-duty engines, the manufacturer's recommended engine speed with the clutch disengaged. For automatic transmission code heavy-duty engines, curb idle means the manufacturer's recommended engine speed with the automatic transmission in gear and the output shaft stalled. (Measured idle speed may be used in lieu of curb-idle speed for the emission tests when the difference between measured idle speed and curb idle speed is sufficient to cause a void test under either § 86.1341 or § 86.884-7 but not sufficient to permit adjustment in accordance with § 86.085-25.)

"Departure angle" means the smallest angle, in a plan side view of an automobile, formed by the level surface on which the automobile is standing and a line tangent to the rear tire static loaded radius arc and touching the underside of the automobile rearward of the rear tire.

"Emission-related maintenance" means that maintenance which does substantially affect emissions or which is likely to affect the deterioration of the vehicle or engine with respect to emissions, even if the maintenance is performed at some time other than that which is recommended.

"Heavy-passenger cars" means, for the 1984 model year only, a passenger car or passenger car derivative capable of seating 12 passengers or less, rated at 6,000 pounds GVW or more and having an equivalent test weight of 5,000 pounds or more.

"Non-emission related maintenance" means that maintenance which does not substantially affect emissions and which does not have a lasting effect on the deterioration of the vehicle or engine with respect to emissions once the maintenance is performed at any particular date.

"Scheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed on a periodic basis to prevent part failure or vehicle (if the engine were installed in a vehicle) malfunction, or anticipated as necessary to correct an overt indication of vehicle malfunction or failure for which periodic maintenance is not appropriate.

"Special features enabling off-street or off-highway operation and use" means a vehicle:

(1) That has 4-wheel drive; and

(2) That has at least four of the following characteristics calculated when the automobile is at curb weight, on a level surface, with the front wheels parallel to the vehicle's longitudinal centerline, and the tires inflated to the manufacturer's recommended pressure;

(i) Approach angle of not less than 28 degrees.

(ii) Breakover angle of not less than 14 degrees.

(iii) Departure angle of not less than 20 degrees.

(iv) Running clearance of not less than 8 inches.

(v) Front and rear axle clearances of not less than 7 inches each.

"Static loaded radius arc" means a portion of a circle whose center is the center of a standard tire-rim combination of an automobile and whose radius is the distance from that center to the level surface on which the automobile is standing, measured with the automobile at curb weight, the wheel parallel to the vehicle's longitudinal centerline, and the tire inflated to the manufacturer's recommended pressure.

"Unscheduled maintenance" means any adjustment, repair, removal disassembly, cleaning, or replacement of vehicle components or systems which is performed to correct a part failure or vehicle (if the engine were installed in a vehicle) malfunction which was not anticipated.

"Useful life" means:

(a) For light-duty vehicles a period of use of 5 years or 50,000 miles, whichever first occurs.

(b)(1) For a light-duty truck engine family or heavy-duty engine family, the average period of use up to engine retirement or rebuild, whichever occurs first, as determined by the manufacturer under § 86.084-21(b)(4)(ii)(B).

(2) For a specific light-duty truck or heavy-duty engine, the period of use represented by the first occurring of the following:

(i) The engine reaches the point of needing to be rebuilt, according to the criteria established by the manufacturer under § 86.084-21(b)(4)(ii)(C), or

(ii) The engine reaches its engine family's useful life.

(3) If the useful life of a specific light-duty truck or heavy-duty engine is found to be less than 5 years or 50,000 miles (or the equivalent), the useful life shall be a period of use of 5 years or 50,000 miles (or the equivalent), whichever occurs first, as required by section 202(d)(2) of the Act.

(4) For purpose of identification this option shall be known as the average useful-life period.

(c)(1) As an option for a light-duty truck engine family, a period of use of 12 years or 130,000 miles, whichever occurs first.

(2) As an option for a gasoline heavy-duty engine family, a period of use of 10 years or 120,000 miles, whichever occurs first.

(3) As an option for a diesel heavy-duty engine family, a period of use of 10 years or 120,000 miles, whichever occurs first, for engines certified for use in vehicles of less than 19,500 pounds GVWR; a period of use of 10 years or 200,000 miles, whichever occurs first, for engines certified for use in vehicles of 19,501-26,000 pounds GVWR; or, a period of use of 10 years or 275,000 miles, whichever occurs first, for engines certified for use in vehicles whose GVWR exceeds 26,000 pounds.

(4) As an option for both light-duty truck and heavy-duty engine families, an alternate full-life value assigned by the Administrator under § 86.084-21(b)(4)(ii)(B)(*4*).

(5) For purpose of identification these options shall be known as the assigned useful-life period options.

(6) For those light-duty truck and heavy-duty engine families using the assigned useful-life period options, the warranty period for emissions defect warranty and emissions performance warranty shall be 5 years/50,000 miles for light-duty trucks, 5 years/50,000 miles for gasoline heavy-duty engines and for diesel heavy-duty engines certified for use in vehicle of less than 19,501 lbs. GVWR, and 5 years/100,000 miles for all other diesel heavy-duty engines. However, in no case may this period be less than the basic mechanical warranty period.

(7) The assigned useful-life period options, as detailed in paragraphs (c)(1) through (c)(6) of this section, are applicable for the 1984 model year only.

(d)(1) As an option for the 1984 model year and for the 1984 model year only, the useful life of light-duty trucks and heavy-duty engine families may be defined as prescribed in § 86.077-2.

(2) For purpose of identification this option shall be known as the half-life useful-life option.

[45 FR 63747, Sept. 25, 1980, as amended at 47 FR 49811, Nov. 2, 1982; 48 FR 1412, Jan. 12, 1983; 48 FR 48607, Oct. 19, 1983; 49 FR 48136, Dec. 10, 1984]

§ 86.084-4 Section numbering; construction.

(a) *Section numbering.* (1) The model year of initial applicability is indicated by the last two digits of the 5-digit group. A section remains in effect for subsequent model years until it is superseded. The number following the hyphen designates what previous section is replaced by a future regulation.

EXAMPLES: Section 86.077-6 applies to the 1977 and subsequent model years until superseded. If a § 86.080-6 is promulgated it would take effect with the 1980 model year; § 86 077-6 would not apply after the 1979 model year. Section 86.077-10 would be replaced by § 86.078-10 beginning with the 1978 model year.

(2) Where a section still in effect references a section that has been superseded, the reference shall be interpreted to mean the superseding section.

(b) *Construction.* Except where indicated, the language in this subpart applies to both vehicles and engines. In many instances, language referring to engines is enclosed in parentheses and immediately follows the language discussing vehicles.

[45 FR 63747, Sept. 25, 1980]

§ 86.084-5 General standards; increase in emissions; unsafe conditions.

(a)(1) Every new motor vehicle (or new motor vehicle engine) manufactured for sale, sold, offered for sale, introduced, or delivered for introduction to commerce, or imported into the United States for sale or resale which is subject to any of the standards prescribed in this subpart shall be covered by a certificate of conformity issued pursuant to §§86.081-21, 86.081-22, 86.079-23, and §§ 86.079-29 through 86.079-34.

(2) No heavy-duty vehicle manufacturer shall take any of the actions specified in section 203(a)(1) of the Act with respect to any gasoline-fueled or diesel heavy-duty vehicle which uses an engine which has not been certified as meeting applicable standards.

(b)(1) Any system installed on or incorporated in a new motor vehicle (or new motor vehicle engine) to enable such vehicle (or engine) to conform to standards imposed by this subpart:

(i) Shall not in its operation or function cause the emission into the ambient air or any noxious or toxic substance that would not be emitted in the operation of such vehicle (or engine) without such system, except as specifically permitted by regulation; and

(ii) Shall not in its operation, function, or malfunction result in any unsafe condition endangering the motor vehicle, its occupants, or persons or property in close proximity to the vehicle.

(2) In establishing the physically adjustable range of each adjustable parameter on a new motor vehicle (or new motor vehicle engine), the manufacturer shall ensure that, taking into consideration the production tolerances, safe vehicle driveability characteristics are available within that range, as required by section 202(a)(4) of the Clean Air Act.

(3) Every manufacturer of new motor vehicles (or new motor vehicle engines) subject to any of the standards imposed by this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicles (or motor vehicle engines) in accordance with good engineering practice to ascertain that such test vehicles (or test engines) will meet the requirements of this section for the useful life of the vehicle (or engine).

[45 FR 4150, Jan. 21, 1980, as amended at 47 FR 49811, Nov. 2, 1982]

§ 86.084-14 Small-volume manufacturers certification procedures.

(a) The small-volume manufacturers certification procedures described in paragraphs (b) and (c) of this section are optional. Small-volume manufacturers may use these optional procedures to demonstrate compliance with the general standards and specific emission requirements contained in this subpart.

(b)(1) The optional small-volume manufacturers certification procedures apply to light-duty vehicles, light-duty trucks, and heavy-duty engines produced by manufacturers with U.S. sales (for the model year in which certification is sought) of fewer than 10,000 units (LDV, LDT, and HDE combined).

(2) For the purpose of determining the applicability of paragraph (b)(1) of this section, where there is more than one importer or distributor of vehicles and/or engines manufactured by the same person, the sales the Administrator shall use shall be the aggregate of the projected or actual sales of those vehicles and/or engines by all of the importers and distributors.

(c) Small-volume manufacturers shall demonstrate compliance with the applicable sections of this subpart as follows:

(1) Sections 86.084-1 through 86.084-11 are applicable.

(2) Section 86.084-12 is not applicable.

(3) Sections 86.084-13 through 86.084-20 are applicable.

(4) Small-volume manufacturers shall include in its records all of the information that EPA requires in § 86.084-21. This information will be considered part of the manufacturer's application for certification. However, the manufacturer is not required to submit the information to the Administrator unless the Administrator requests it.

(5) Section 85.084-22 is applicable except as noted below.

(i) Small-volume light-duty vehicle and light-duty truck manufacturers may satisfy the requirements of paragraph (e) of § 86.084-22 by including a statement of compliance on adjustable parameters in the application for certification. In the statement of compliance the manufacturer shall state that the limits, stops, seals, or other means used to inhibit adjustment have been designed to accomplish their intended purpose based on good engineering practice and past experience. If the vehicle parameter is adjustable the vehicle must meet emission standards with the parameter set any place within the adjustable range (reference § 86.084-21).

(ii) Paragraphs (a), (b), (c), and (d) of § 86.084-22 are not applicable.

(6) Section 86.084-23 is applicable.

(7) Section 86.084-24 is applicable except as noted below.

(i) Small-volume manufacturers may satisfy the requirements of paragraphs (b) and (c) of § 86.084-24 by:

(A) Selecting emission-data test vehicles (engines) by the worst case emissions criteria as follows:

(*1*) *Light duty vehicles and light-duty trucks.* The test vehicle shall be selected based on the following criteria: The manufacturer shall select the heaviest (including options) vehicle within the family. Then within that vehicle it shall select, in the order listed, the largest frontal area, largest displacement, the highest numerical axle ratio with the largest tire offered in the engine family, and the maximum fuel flow calibration.

(*2*) *Heavy-duty gasoline fueled engines.* The manufacturer shall select the worst case emission-data engine first based on the largest displacement within the engine family. Then within the largest displacement the manufacturer shall select, in the order listed, highest fuel flow at the speed of maximum rated torque, the engine with the most advance spark timing, no EGR or lowest EGR flow, and no air pump or lowest actual flow air pump.

(*3*) *Heavy-duty diesel engines.* The manufacturer shall select in each engine family the worst case emission data engine based on the highest fuel feed per stroke, primarily at the speed of maximum rated torque and secondarily at the rated speed.

(B) Testing light-duty vehicle or light-duty truck emission-data vehicles at any service accumulation distance less than 6,436 kilometers (4,000 miles) or heavy-duty engine emission-data engines at any service accumulation time less than 125 hours.

(C) Using assigned deterioration factors that the Administrator determines and prescribes. However, the manufacturer may, at its option, accumulate miles (hours) on a durability-data vehicle (engine) and complete emission tests for the purpose of establishing its own deterioration factor.

(ii) Paragraphs (d) and (e) of § 86.084-24 are not applicable.

(8) Section 86.084-25 is applicable to durability-data light-duty vehicles, light-duty trucks, and heavy-duty engines if the manufacturer does not use assigned deterioration factors.

(9) Sections 86-084-26 and 86.084-27 are not applicable.

(10) Sections 86.084-28 and 86.084-29 are applicable.

(11)(i) Section 86.084-30 of this subpart is applicable, except for paragraphs (a)(2) and (b) of that section. In the place of these paragraphs, small-volume manufacturers shall comply with paragraphs (c)(11)(ii) through (v) of this section.

(ii) Small-volume manufacturers shall submit an application for certification containing the following:

(A) The names, addresses, and telephone numbers of the persons the manufacturer authorizes to communicate with us.

(B) A brief description of the vehicles (or engines) covered by the certificate (the manufacturers' sales data book or advertising, including specifications, may satisfy this requirement for most manufacturers). The description shall include, as a minimum, the following items as applicable:

(*1*) Engine families and vehicles (or engine) configurations.

(*2*) Vehicle or engine models to be listed on the certificate of conformity.

(*3*) The test weight and horsepower setting for each vehicle or engine configuration.

(*4*) Projected sales.

(*5*) Combustion cycle.

(*6*) Cooling mechanism.

(*7*) Number of cylinders.

(*8*) Displacement.

(*9*) Fuel system type.

(*10*) Number of catalytic converters, volume, and composition.

(*11*) Method of air aspiration.

(*12*) Thermal reactor characteristics.

(*13*) Suppliers' and/or manufacturers' name and model number of any emission-related items identified in paragraphs (c)(11)(ii)(B) (*1*) through (*12*) of this section, if purchased from a supplier or manufacturer who uses the items in its own certified vehicle(s) or engine(s).

(*14*) A list of emission component part numbers

(*15*) Drawings, calibration curves, and descriptions of emission related components, including those components regulated under paragraph (e) of § 86.084–22, and schematics of hoses and other devices connecting these components.

(*16*) Vehicle adjustments or modifications necessary for light-duty trucks to assure that they conform to high-altitude standards.

(*17*) A description of the light-duty vehicles and light-duty trucks that are exempted from either the low- or high-altitude emission standards, as applicable.

(C) The results of all emission tests the manufacturer performs to demonstrate compliance with the applicable standards.

(D)(*1*) The following statement signed by the authorized representative of the manufacturer: "The vehicles (or engines) described herein have been tested in accordance with [list of the applicable Subpart A, B, D, I, N, or P] of Part 86, Title 40, United States Code of Federal Regulations, and on the basis of those tests are in conformance with that subpart. All of the data and records required by that subpart are on file and are available for inspection by the EPA Administrator. We project the total U.S. sales of vehicles (engines) subject to this subpart to be fewer than 10,000 units."

(*2*) A statement as required by and contained in paragraph (c)(5) of § 86.084–14 signed by the authorized representative of the manufacturer.

(*3*) A statement that the vehicles or engines described in the manufacturers application for certification are not equipped with auxiliary emission control devices which can be classified as a defeat device as defined in § 86.084–2.

(*4*) A statement of compliance with section 206(a)(3) of the Clean Air Act.

(*5*) A statement that, based on the manufacturer's engineering evaluation and/or emission testing, the light-duty vehicles comply with emission standards at high altitude unless exempt under paragraph (h) of § 86.084–8.

(*6*) A statement that, based on the manufacturers engineering evaluation and/or emission testing, the light-duty trucks sold for principle use at designated high-altitude locations comply with the high-altitude emission requirements and that all other light-duty trucks are at least capable of being modified to meet high-altitude standards unless exempt under paragraph (g)(2) of § 86.084–9.

(iii) If the manufacturer meets requirements of this subpart, the Administrator will issue a certificate of conformity for the vehicles described in the application for certification.

(iv) The certificate will be issued for such a period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any vehicle or engine covered by the certificate will meet the requirements of the Act and of this subpart.

(v)(A) If, after a review of the statements and descriptions submitted by the manufacturer, the Administrator determines that the manufacturer has not met the applicable requirements, the Administrator shall notify the manufacturer in writing, setting forth the basis for his determination. The manufacturer may request a hearing on the Administrator's determination.

(B) If the manufacturer does not request a hearing or present the required information the Administrator will deny certification.

(12) Sections 86.084-31 and 86.084-32 are not applicable.

(13) Under § 86.084-33, small-volume manufacturers are covered by the following.

(i) Small-volume manufacturers may make production changes (running changes) without receiving the Administrator's prior approval. The manufacturer shall assure (by conducting emission tests as it deems necessary) that the affected vehicles (engines) remain in compliance with the requirements of this part.

(ii) The manufacturer shall notify the Administrator within seven days after implementing any production related change (running change) that would affect vehicle emissions. This notification shall include any changes to the information required under paragraph (c)(11)(ii) of this section. The manufacturer shall also amend as necessary its records required under paragraph (c)(4) of this section to conform with the production design change.

(14) Section 86.084-34 is not applicable.

(15) Sections 86.084-35 through 86.084-39 are applicable.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 48608, Oct. 19, 1983, as amended at 50 FR 4514, Jan. 31, 1985; 52 FR 47863, Dec. 16, 1987]

§ 86.084-15 Emission standards for 1984 model year heavy-passenger cars.

(a)(1) Model year 1984 heavy-passenger cars shall not exceed the following exhaust emission standards when tested under low-altitude conditions.

(i) *Hydrocarbons.* 0.41 gram per vehicle mile (0.255 gram per vehicle kilometer);

(ii) *Carbon monoxide.* 3.4 grams per vehicle mile (2.11 grams per vehicle kilometer);

(iii) *Oxides of nitrogen.* 1.0 gram per vehicle mile (0.62 gram per vehicle kilometer).

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part for light-duty vehicles, except as otherwise provided, and measured and calculated in accordance with those procedures.

(b)(1) Fuel evaporative emissions from 1984 model year heavy-passenger cars shall not exceed when tested under low-altitude conditions: *Hydrocarbons.* 2.0 grams per test.

(2) The standards set forth in paragraph (b)(1) of this section refer to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part for light-duty vehicles, except as otherwise provided, and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1984 model year heavy-passenger car.

(d)(1) Model year 1984 heavy-passenger cars shall not exceed the following exhaust emission standards when tested under high-altitude conditions:

(i) *Hydrocarbons.* 0.57 grams per vehicle mile (0.35 gram per vehicle kilometer).

(ii) *Carbon monoxide.* 7.8 grams per vehicle mile (4.8 grams per vehicle kilometer).

(iii) *Oxides of nitrogen.* 1.0 gram per vehicle mile (0.62 gram per vehicle kilometer).

(2) The standards set forth in paragraph (d)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part for light-duty vehicles, except as otherwise provided, and measured and calculated in accordance with those procedures.

(e)(1) Fuel evaporative emissions from 1984 model year heavy-passenger cars shall not exceed 2.6 grams per test when tested under high-altitude conditions.

(2) The standard set forth in paragraph (e)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part for light-duty vehicles, except as otherwise provided, and measured in accordance with those procedures.

(f) Any 1984 model year heavy-passenger car that a manufacturer wishes to certify for sale shall meet the emission standards under both low- and high-altitude conditions as specified in § 86.082-2, as applicable. Vehicles shall meet emission standards under both low- and high-altitude conditions without manual adjustments or modifications. Any emission control device used to meet emission standards under high-altitude conditions shall initially actuate (automatically) no higher that 4,000 feet above sea level.

(g) Except as otherwise provided in this part, heavy passenger cars are subject to the provisions applicable to light-duty vehicles in this part and in Part 85 of 40 CFR.

[48 FR 48609, Oct. 19, 1983]

§ 86.084-26 Mileage and service accumulation; emission measurements.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles.

(2) The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV to this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 86.129, the manufacturer may elect to conduct the respective emission tests at higher loaded vehicle weight.

(3) *Emission-data vehicles.* Unless as otherwise provided for in § 86.084-23(a), emission-data vehicles shall be operated and tested as follows:

(i) *Gasoline-fueled.* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. Any vehicle used to represent emission-data vehicle selections under § 86.084-24(b)(1) shall be equipped with an engine and emission control system that has accumulated at least the mileage determined under this paragraph. Fuel economy data generated from certification vehicles selected in accordance with § 86.084-24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006-82(c). Complete exhaust and evaporative (if required) emission tests shall be conducted for each emission-data vehicle selection under § 86.084-24(b)(1). The Administrator may determine under § 86.084-24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.084-24(b)(1) (v) or (viii) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing under high-altitude conditions.

(C) Exhaust and evaporative emissions tests for emission-data vehicle(s) selected for testing under § 86.084-24(b)(1) (i), (ii), (iii), (iv), or (vii)(B) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing under low-altitude conditions.

(D) For each engine family, the manufacturer will either select one vehicle previously selected under § 86.084-24(b)(1)(i) through (iv) to be tested under high-altitude conditions or provide a statement in accordance with § 86.084-24(b)(1)(v). Vehicles shall meet emission standards under both low- and high-altitude conditions without manual adjustments or modifications. In addition, any emission control device used to conform with the emission standards under high-altitude conditions shall initially actuate (automatically) no higher than 4,000 feet above sea level.

(ii) *Diesel.* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. Any vehicle used to represent emission-data vehicle selections under § 86.084–24(b)(1) shall be equipped with an engine and emission control system that has accumulated at least the mileage determined under this paragraph. Fuel economy data generated from certification vehicles selected in accordance with § 86.084–24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006–82(c). Complete exhaust emission tests shall be conducted for each emission-data vehicle selection under § 86.084–24(b)(1). The Administrator may determine under § 86.084–24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.084–24(b)(1)(v) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing under low-altitude conditions.

(C) Exhaust and evaporative emission tests for emission-data vehicle(s) selected for testing under § 86.084–24(b)(1)(i) through (iv) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing under low-altitude conditions.

(D) For each engine family, the manufacturer will either select one vehicle previously selected under § 86.084–24(b)(1)(i) through (iv) to be tested under high-altitude conditions or provide a statement in accordance with § 86.084–24(b)(1)(v). Vehicles shall meet emission standards under both low- and high-altitude conditions without manual adjustments or modifications. In addition, any emission control device used to conform with the emission standards under high-altitude conditions shall initially actuate (automatically) no higher than 4,000 feet above sea level.

(4) *Durability-data vehicles.* Unless as otherwise provided for in § 86.084–23(a), durability-data vehicles shall be operated and tested as follows:

(i) *Durability-data vehicles.* (A) Unless otherwise provided for in § 86.085–23(a), each durability-data vehicle shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objectives of this procedure.

(B) Complete exhaust emission tests shall be made at test point mileage intervals that the manufacturer determines.

(C) At a minimum, two complete exhaust emission tests shall be made. The first test shall be made at a distance not greater than 6,250 miles. The last test shall be made at 50,000 miles.

(D) The mileage interval between test points must be of equal length except for the interval between zero miles and the first test and any interval before or after testing conducted in conjunction with vehicle maintenance as specified in § 86.085–25(a)(10).

(ii) The manufacturer may, at its option, alter the durability-data vehicle at the selected test point to represent emission-data vehicle(s) within the same engine/system combination and perform emission tests on the altered vehicle. Upon completion of emission testing, the manufacturer must return the test vehicle to the durability-data vehicle configuration prior to the continuation of mileage accumulation.

(5)(i) All tests required by this subpart on emission-data vehicles shall be conducted at a mileage equal to or greater than the mileage the manufacturer determines under paragraph (a)(3) of this section.

(ii) All tests required by this subpart on durability-data vehicles shall be conducted within 250 miles of each of the test points.

(6)(i)(A) The manufacturer may conduct multiple tests at any test point at which the data are intended to be used in the deterioration factor. At each test point where multiple tests are conducted, the test results from all valid tests shall be averaged to determine the data point to be used in the deterioration factor calculation, except under paragraph (a)(6)(i)(B) of this section. The test results from emission tests performed before maintenance affecting emissions shall not be averaged with test results after the maintenance.

(B) The manufacturer is not required to average multiple tests if the manufacturer conducts no more than three tests at each test point and if the number of tests at each test point is equal. All test points must be treated the same for all exhaust pollutants.

(ii) The results of all emission testing shall be supplied to the Administrator. The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) may be submitted weekly to the Administrator, but shall be air posted or delivered to the Administrator within 7 days after completion of the test. In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.084–23. Where the Administrator conducts a test on a durability-data vehicle at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(iii) The results of all emission tests shall be rounded, in accordance with ASTM E 29-67, to the number of decimal places contained in the applicable emission standard expressed to one additional significant figure.

(7) Whenever a manufacturer intends to operate and test a vehicle which may be used for emission or durability data, the manufacturer shall retain in its records all information concerning all emissions tests and maintenance, including vehicle alterations to represent other vehicle selections. For emission-data vehicles, this information shall be submitted, including the vehicle description and specification information required by the Administrator, to the Administrator following the emission-data test. For durability-data vehicles, this information shall be submitted following the 5,000-mile test.

(8) Once a manufacturer submits the information required in paragraph (a)(7) of this section for a durability-data vehicle, the manufacturer shall continue to run the vehicle to 50,000 miles, and the data from the vehicle will be used in the calculations under § 86.084–28. Discontinuation of a durability-data vehicle shall be allowed only with the consent of the Administrator.

(9)(i) The Administrator may elect to operate and test any test vehicle during all or any part of the mileage accumulation and testing procedure. In such cases, the manufacturer shall provide the vehicle(s) to the Administrator with all information necessary to conduct this testing.

(ii) The test procedures in §§ 86.106 through 86.145 will be followed by the Administrator. The Administrator will test the vehicles at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other vehicles of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(10) Emission testing of any type with respect to any certification vehicle other than that specified in this part is not allowed except as such testing may be specifically authorized by the Administrator.

(11) This section does not apply to testing conducted to meet the requirements of § 86.084–23(b)(2).

(b)(1) Paragraph (b) of this section applies to light-duty trucks.

(2) There are three types of mileage or service accumulation applicable to light-duty trucks:

(i) Mileage or service accumulation on vehicles, engines, subsystems, or components selected by the manufacturer under § 86.084–24(c)(2)(i). The manufacturer determines the form and extent of this mileage or service accumulation, consistent with good engineering practice, and describes it in the application for certification.

(ii) Mileage accumulation of the duration selected by the manufacturer on emission-data vehicles selected under § 86.084–24(b)(1). The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV to this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 86.129, the manufacturer may elect to conduct the respective emission tests at the test weight corresponding to the higher loaded vehicle weight.

(iii) Service or mileage accumulation which may be part of the test procedures used by the manufacturer to establish evaporative emission deterioration factors.

(3) Exhaust emission deterioration factors will be determined on the basis of the mileage or service accumulation described in paragraph (b)(2)(i) of this section and related testing, according to the manufacturer's procedures.

(4) Each emission-data vehicle shall be operated and tested as follows:

(i) *Gasoline-fueled.* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. Any vehicle used to represent emission-data vehicle selections under § 86.084–24(b)(1) shall be equipped with an engine and emission control system that has accumulated at least the mileage determined under this paragraph. Fuel economy data generated from certification vehicles selected in accordance with § 86.084–24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006–82(c). Complete exhaust emission tests shall be conducted for each emission-data vehicle selection under § 86.084–24(b)(1). The Administrator may determine under § 86.084–24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.084–24(b)(1) (v) or (viii) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing or at 6,436 kilometers (4,000 miles) under high-altitude conditions.

(C) Exhaust and evaporative emission tests for emission-data vehicle(s) selected for testing under § 86.084–24(b)(1) (ii), (iii), (iv)(A), or (vii)(B) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing or at the 6,436-kilometer (4,000-mile) test point under low-altitude conditions.

(D) If the manufacturer recommends adjustments or modifications in order to conform to emission standards at high altitude, such adjustments or modifications shall be made to the test vehicle selected under § 86.084.24(b)(1)(v) and (viii) (in accordance with the instructions to be provided to the ultimate purchaser) before being tested under high-altitude conditions.

(ii) *Diesel.* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. Any vehicle used to represent emission-data vehicle selections under § 86.084–24(b)(1) shall be equipped with an engine and emission control system that has accumulated at least the mileage determined under this paragraph. Fuel economy data generated from certification vehicles selected in accordance with § 86.084-24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006-82(c). Complete exhaust emission tests shall be conducted for each emission-data vehicle selection under § 86.084-24(b)(1). The Administrator may determine under § 86.084-24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.084-24(b) (1) (v) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing or at the 6,436-kilometer (4,000-mile) test point under low-altitude conditions.

(C) Exhaust and evaporative emission tests for emission-data vehicle(s) selected for testing under § 86.084-24(b) (1) (ii), (iii), and (iv) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing or at the 6,436-kilometer (4,000-mile) test point under low-altitude conditions.

(D) If the manufacturer recommends adjustments or modifications in order to conform to emission standards at high altitude, such adjustments or modifications shall be made to the test vehicle selected under § 86.084-24(b)(1)(v) and (viii) (in accordance with the instructions to be provided to the ultimate purchaser) before being tested under high-altitude conditions.

(iii) [Reserved]

(iv) All tests required by this subpart on emission-data vehicles shall be conducted at a mileage equal to or greater than the mileage the manufacturer determines under paragraph (b)(4) of this section.

(c)(1) Paragraph (c) of this section applies to heavy-duty engines.

(2) There are two types of service accumulation applicable to heavy-duty engines:

(i) Service accumulation on engines, subsystems, or components selected by the manufacturer under § 86.084-24(c)(3)(i). The manufacturer determines the form and extent of this service accumulation, consistent with good engineering practice, and describes it in the application for certification.

(ii) Dynamometer service accumulation on emission-data engines selected under § 86.084-24(b)(2) or § 86.084-24(b)(3). The manufacturer determines the engine operating schedule to be used for dynamometer service accumulation, consistent with good engineering practice. A single engine operating schedule shall be used for all engines in an engine family-control system combination. Operating schedules may be different for different combinations.

(3) Exhaust emission deterioration factors will be determined on the basis of the service accumulation described in paragraph (b)(2)(i) of this section and related testing, according to the manufacturer's procedures.

(4) The manufacturer shall determine, for each engine family, the number of hours at which the engine system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested a record of the rationale used in making this determination. The manufacturer may elect to accumulate 125 hours on each test engine within an engine family without making a determination. Any engine used to represent emission-data engine selections under § 86.084-24(b)(2) shall be equipped with an engine system combination that has accumulated at least the number of hours determined under this paragraph. Complete exhaust emission tests shall be conducted for each emission-data engine selection under § 86.084-24(b)(2). Evaporative emission controls need not be connected provided normal operating conditions are maintained in the engine induction system. The Administrator may determine under § 86.084(f) that no testing is required.

(d)(1) Paragraph (d) of this section applies to both light-duty trucks and heavy-duty engines.

(2)(i) The results of all emission testing shall be supplied to the Administrator. The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriated based upon the explanation given by the manufacturer for the voided test. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) may be submitted weekly to the Administrator, but shall be air posted or delivered to the Administrator within 7 days after completion of the tests. In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.084-23. Where the Administrator conducts a test on a durability-data vehicle at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be recorded and reported to the Administrator. These test results shall be rounded, in accordance with ASTM E 29-67, to the number of decimal places contained in the applicable emission standard expressed to one additional significant figure.

(3) Whenever a manufacturer intends to operate and test a vehicle (or engine) which may be used for emission data, the manufacturer shall retain in its records all information concerning all emissions tests and maintenance, including vehicle (or engine) alterations to represent other vehicle (or engine) selections. This information shall be submitted, including the vehicle (or engine) description and specification information required by the Administrator, to the Administrator following the emission-data test.

(4)—(5) [Reserved]

(6) Emission testing of any type with respect to any certification vehicle or engine other than that specified in this subpart is not allowed except as such testing may be specifically authorized by the Administrator.

[45 FR 63757, Sept. 25, 1980, as amended at 46 FR 50489, Oct. 13, 1981; 47 FR 49807, 49812, Nov. 2, 1982; 48 FR 1425, Jan. 12, 1983; 48 FR 7398, Feb. 18, 1983; 48 FR 48610, Oct. 19, 1983; 51 FR 24609, July 7, 1986; 52 FR 47863, Dec. 16, 1987]

§ 86.084-40 Automatic expiration of reporting and recordkeeping requirements.

(a) [Reserved]

(b) *Light-duty trucks and heavy-duty engines.* (1) All of the recordkeeping and reporting requirements in this subpart for which 1984 is the first model year of implementation will automatically expire on December 31, 1988, unless the Administrator acts to retain them.

(2) If the Administrator determines that the reporting and recordkeeping requirements should be retained she/he will also at that time establish the subsequent date of expiration, which will not be later than December 31, 1993.

[45 FR 63770, Sept. 25, 1980]

§ 86.085-1 General applicability.

(a) The provisions of this subpart apply to 1985 and later model year new gasoline-fueled and diesel light-duty vehicles, 1985 and later model year new gasoline-fueled and diesel light-duty trucks, and 1985 and later model year new gasoline-fueled and diesel heavy-duty engines.

(b) *Optional applicability.* A manufacturer may request to certify any heavy-duty vehicle 10,000 pounds GVWP or less in accordance with the light-duty truck provisions. Heavy-duty engine or vehicle provisions do not apply to such a vehicle.

(c) [Reserved]

(d) *Alternative Durability Program.* For 1985 and later model year light-duty vehicles and light-duty trucks, a manufacturer may elect to participate in the Alternative Durability Program. This optional program provides an alternative method of determining exhaust emission control system durability. The general procedures and a description of the programs are contained in § 86.085-13 and specific provisions on test vehicles and compliance procedures are contained in §§ 86.085-24 and 86.085-28 respectively.

(e) *Small volume manufacturers.* Special certification procedures are available for any manufacturer whose projected combined U.S. sales of light-duty vehicles, light-duty trucks, and heavy-duty engines in its product line are fewer than 10,000 units for the model year in which the manufacturer seeks certification. In order to certify its product line under these optional procedures, the small-volume manufacturer must first obtain the Administrator's approval. Vehicles produced at facilities leased, operated, controlled, supervised, or in 10 percent or greater part owned by the manufacturer shall be counted in calculating the total sales of the manufacturer. The small-volume manufacturer's certification procedures are described in § 86.084-14.

(f) *Optional Procedures for Determining Exhaust Opacity.* (1) The provisions of Subpart I apply to tests which are performed by the Administrator, and optionally, by the manufacturer.

(2) Measurement procedures, other than that described in Subpart I, may be used by the manufacturer provided the manufacturer satisfies the requirements of § 86.085-23(f).

(3) When a manufacturer chooses to use an alternative measurement procedure it has the responsibility to determine whether the results obtained by the procedure will correlate with the results which would be obtained from the measurement procedure in Subpart I. Consequently, the Administrator will not routinely approve or disapprove any alternative opacity measurement procedure or any associated correlation data which the manufacturer elects to use to satisfy the data requirements of Subpart I.

(4) If a confirmatory test(s) is performed and the results indicate there is a systematic problem suggesting that the data generated under an optional alternative measurement procedure do not adequately correlate with Subpart I data, EPA may require that all certificates of conformity not already issued by based on data from Subpart I procedures.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601(a))

[48 FR 22548, May 19, 1983, as amended at 50 FR 10648, Mar. 15, 1985; 51 FR 24608, July 7, 1986]

§ 86.085-2 Definitions.

The definitions of § 86.084-2 remain effective. The definitions listed in this section apply beginning with the 1985 model year.

"Abnormally treated vehicle", any diesel light-duty vehicle or diesel light-duty truck that is operated for less than five miles in a 30 day period immediately prior to conducting a particulate emissions test.

"Composite particulate standard", for a manufacturer which elects to average diesel light-duty vehicles and diesel light-duty trucks together in the particulate averaging program, means that standard calculated according to the following equation and rounded to the nearest hundredth gram-per-mile:

$$\frac{(\mathrm{PROD}_{\mathrm{LDV}})(\mathrm{STD}_{\mathrm{LDV}})+(\mathrm{PROD}_{\mathrm{LDT}})(\mathrm{STD}_{\mathrm{LDT}})}{(\mathrm{PROD}_{\mathrm{LDV}})+(\mathrm{PROD}_{\mathrm{LDT}})} = \text{Manufacturer composite particulate standard}$$

Where:

$\mathrm{PROD}_{\mathrm{LDV}}$ represents the manufacturer's total diesel light-duty vehicle production for those engine families being included in the average for a given model year.

$\mathrm{STD}_{\mathrm{LDV}}$ represents the light-duty vehicle particulate standard.

$\mathrm{PROD}_{\mathrm{LDT}}$ represents the manufacturer's total diesel light-duty truck production for those engine families being included in the average for a given model year.

$\mathrm{STD}_{\mathrm{LDT}}$ represents the light-duty truck particulate standard.

"Family particulate emission limit" means the diesel particulate emission level to which an engine family is certified in the particulate averaging program, expressed to an accuracy of one hundredth gram-per-mile.

"Incomplete gasoline-fueled heavy-duty vehicle" means any gasoline-fueled heavy-duty vehicle which does not have the primary load-carrying device, or passenger compartment, or engine compartment or fuel system attached.

"Production-weighted average" means the manufacturer's production-weighted average particulate emission level, for certification purposes, of all of its diesel engine families included in the particulate averaging program. It is calculated at the end of the model year by multiplying each family particulate emission limit by its respective production, summing these terms, and dividing the sum by the total production of the effected families. Those vehicles produced for sale in California or at high altitude shall each be averaged separately from those produced for sale in any other area.

"Primary intended service class" means:

(a) The primary service application group for whch a heavy-duty diesel engine in designed and marketed, as determined by the manufacturer. The primary intended service classes are designated as light, medium, and heavy heavy-duty diesel engines. The determination is based on factors such as vehicle GVW, vehicle usage and operating patterns, other vehicle design characteristics, engine horsepower, and other engine design and operating characteristics.

(1) Light heavy-duty diesel engines usually are non-sleeved and not designed for rebuild; their rated horsepower generally ranges from 70 to 170. Vehicle body types in this group might include any heavy-duty vehicle built for a light-duty truck chassis, van trucks, multi-stop vans, recreational vehicles, and some single axle straight trucks. Typical applications would include personal transportation, light-load commercial hauling and delivery, passenger service, agriculture, and construction. The GVWR of these vehicles is normally less than 19,500 lbs.

(2) Medium heavy-duty diesel engines may be sleeved or non-sleeved and may be designed for rebuild. Rated horsepower generally ranges from 170 to 250. Vehicle body types in this group would typically include school buses, tandem axle straight trucks, city tractors, and a variety of special purpose vehicles such as small dump trucks, and trash compactor trucks. Typical applications would include commercial short haul and intra-city delivery and pickup. Engines in this group are normally used in vehicles whose GVWR varies from 19,500–33,000 lbs.

(3) Heavy heavy-duty diesel engines are sleeved and designed for multiple rebuilds. Their rated horsepower generally exceeds 250. Vehicles in this group are normally tractors, trucks, and buses used in inter-city, long-haul applications. These vehicles normally exceed 33,000 lbs GVWR.

"Useful life" means:

(a) For light-duty vehicles a period of use of 5 years or 50,000 miles, whichever first occurs.

(b) For a light-duty truck engine family, a period of use of 11 years or 120,000 miles, whichever occurs first.

(c) For a gasoline-fueled heavy-duty engine family (and in the case of evaporative emission regulations, for gasoline-fueled heavy-duty vehicles), a period of use of 8 years or 110,000 miles, whichever first occurs.

(d) For a diesel heavy-duty engine family:

(1) For light heavy-duty diesel engines, a period of use of 8 years or 110,000 miles, whichever first occurs.

(2) For medium heavy-duty diesel engines, a period of use of 8 years or 185,000 miles, whichever first occurs.

(3) For heavy heavy-duty diesel engines, a period of use of 8 years or 290,000 miles, whichever first occurs.

(e) As an option for both light-duty truck and heavy-duty engine families, an alternative useful life period assigned by the Administrator under the provisions of paragraph (f) of § 86.085-21.

(f) The useful-life period for purposes of the emissions defect warranty and emissions performance warranty shall be a period of 5 years/50,000 miles whichever first occurs, for light-duty trucks, gasoline heavy-duty engines, and light heavy-duty diesel engines. For all other heavy-duty diesel engines the aforementioned period is 5 years/100,000 miles, whichever first occurs. However, in no case may this period be less than the manufacturer's basic mechanical warranty period for the engine family.

[48 FR 33462, July 21, 1983, as amended at 48 FR 52184, Nov. 16, 1983; 52 FR 47863, Dec. 16, 1987]

§ 86.085-8 Emission standards for 1985 and later model year light-duty vehicles.

(a)(1) Exhaust emissions from 1985 and later model year light-duty vehicles shall not exceed:

(i) *Hydrocarbons.* 0.41 gram per vehicle mile (0.255 gram per vehicle kilometer);

(ii) *Carbon monoxide.* 3.4 grams per vehicle mile (2.11 grams per vehicle kilometer);

(iii) *Oxides of nitrogen.* 1.0 gram per vehicle mile (0.62 gram per vehicle kilometer);

(iv) *Particulate emissions* (diesels only). 0.60 gram per vehicle mile (0.373 gram per vehicle kilometer).

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures.

(b)(1) Fuel evaporative emissions from 1985 and later model year gasoline-fueled light-duty vehicles shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1985 and later model year gasoline-fueled light-duty vehicle.

(d)—(f) [Reserved]

(g) Any 1985 and later model year light-duty vehicle that a manufacturer wishes to certify for sale shall meet the emission standards under both low- and high-altitude conditions as specified in § 86.082-2, except as provided in paragraphs (h) and (i) of this section. Vehicles shall meet emission standards under both low- and high-altitude conditions without manual adjustments or modifications. Any emission control device used to meet emission standards under high-altitude conditions shall initially actuate (automatically) no higher than 4,000 feet above sea level.

(h) The manufacturer may exempt 1985 model year vehicles from compliance at high altitude with the emission standards set forth in paragraphs (a) and (b) of this section if the vehicles are not intended for sale at high altitude and if the requirements of paragraphs (h) (1) and (2) of this section are met.

(1) A vehicle configuration shall only be considered eligible for exemption if the requirements of either paragraph (h)(1) (i), (ii), (iii), or (iv) of this section are met.

(i) Its design parameters (displacement-to-weight ratio (D/W) and engine speed-to-vehicle-speed ratio (N/V)) fall within the exempted range for that manufacturer for that year. The exempted range is determined according to the following procedure:

(A) The manufacturer shall graphically display the D/W and N/V data of all vehicle configurations it will offer for the model year in question. The axis of the abscissa shall be D/W (where (D) is the engine displacement expressed in cubic centimeters and (W) is the equivalent vehicle test weight expressed in pounds), and the axis of the ordinate shall be N/V (where (N) is the crankshaft speed expressed in revolutions per minute and (V) is the vehicle speed expressed in miles per hour). At the manufacturer's option, either the 1:1 transmission gear ratio or the lowest numerical gear ratio available in the transmission will be used to determine N/V. The gear selection must be the same for all N/V data points on the manufacturer's graph. For each transmission/axle ratio combination, only the lowest N/V value shall be used in the graphical display.

(B) The product line is then defined by the equation, $N/V=C(D/W)^{-0.9}$, where the constant, C, is determined by the requirement that all the vehicle data points either fall on the line or lie to the upper right of the line as displayed on the graphs.

(C) The exemption line is then defined by the equation, $N/V=C(0.84\ D/W)^{-0.9}$, where the constant, C is the same as that found in paragraph (h)(1)(i)(B) of this section.

(D) The exempted range includes all values of N/V and D/W which simultaneously fall to the lower left of the exemption line as drawn on the graph.

(ii) Its design parameters fall within the alternate exempted range for that manufacturer that year. The alternate exempted range is determined by substituting rated horsepower (hp) for displacement (D) in the exemption procedure described in paragraph (h)(1)(i) of this section and by using the product line $N/V = C(hp/W)^{-0.9}$.

(A) Rated horsepower shall be determined by using the Society of Automotive Engineers Test Procedure J 1349, or any subsequent version of that test procedure. Any of the horsepower determinants within that test procedure may be used, as long as it is used consistently throughout the manufacturer's product line in any model year.

(B) No exemptions will be allowed under paragraph (h)(1)(ii) of this section to any manufacturer that has exempted vehicle configurations as set forth in paragraph (h)(1)(i) of this section.

(iii) Its acceleration time (the time it takes a vehicle to accelerate from 0 miles per hour to a speed not less than 40 miles per hour and not greater than 50 miles per hour) under high-altitude conditions is greater than the largest acceleration time under low-altitude conditions for that manufacturer for that year. The procedure to be followed in making this determination is:

(A) The manufacturer shall list the vehicle configuration and acceleration time under low-altitude conditions of that vehicle configuration which has the highest acceleration time under low-altitude conditions of all the vehicle configurations it will offer for the model year in question. The manufacturer shall also submit a description of the methodology used to make this determination.

(B) The manufacturer shall then list the vehicle configurations and acceleration times under high-altitude conditions of all those vehicle configurations which have higher acceleration times under high-altitude conditions than the highest acceleration time at low altitude identified in paragraph (h)(1)(iii)(A) of this section.

(iv) In lieu of performing the test procedure of paragraphs (h)(1)(iii) (A) and (B) of this section, its acceleration time can be estimated based on the manufacturer's engineering evaluation, in accordance with good engineering practice, to meet the exemption criteria of paragraph (h)(1)(iii) of this section.

(2) A vehicle shall only be considered eligible for exemption under this paragraph if at least one configuration of its model type (and transmission configuration in the case of vehicles equipped with manual transmissions, excluding differences due to the presence of overdrive) is certified to meet emission standards under high-altitude conditions as specified in paragraphs (a) through (g) of this section. The Certificate of Conformity (the Certificate) covering any exempted configuration(s) will also apply to the corresponding non-exempt configuration(s) required under this subparagraph. As a condition to the exemption, any suspension, revocation, voiding, or withdrawal of the Certificate as it applies to a non-exempt configuration for any reason will result in a suspension of the Certificate as it applies to the corresponding exempted configuration(s) of that model type, unless there is at least one other corresponding non-exempt configuration of the same model type still covered by the Certificate. The suspension of the Certificate as it applies to the exempted configuration(s) will be terminated when any one of the following occurs:

(i) Another corresponding non-exempt configuration(s) receive(s) coverage under the Certificate; or

(ii) Suspension of the Certificate as it applies to the corresponding non-exempt configuration(s) is terminated; or

(iii) The Agency's action(s), with respect to suspension, revocation, or voiding of the Certificate as it applies to the corresponding non-exempt configuration(s), is reversed.

(3) The sale of a vehicle for principal use at a designated high-altitude location that has been exempted as set forth in paragraph (h) of this section will be considered a violation of section 203(a)(1) of the Clean Air Act.

(i)(1) The manufacturers may exempt 1985 and later model year vehicles from compliance at low altitude with the emission standards set forth in paragraphs (a) and (b) of this section if the vehicles:

(i) Are not intended for sale at low altitude; and

(ii) Are equipped with a unique, high-altitude axle ratio (rear-wheel drive vehicles) or a unique, high-altitude drivetrain (front-wheel drive vehicles) with a higher N/V ratio than other configurations of that model type which are certified in compliance with the emission standards of paragraphs (a) and (b) of this section under low-altitude conditions.

(2) The sale of a vehicle for principal use at low altitude that has been exempted as set forth in paragraph (i) of this section will be considered a violation of section 203(a)(1) of the Clean Air Act.

(Approved by the Office of Management and Budget under control number 2000-0390)

[45 FR 14505, Mar. 5, 1980, as amended at 48 FR 48612, Oct. 19, 1983; 49 FR 3017, Jan. 24, 1984; 50 FR 4514, Jan. 31, 1985]

§ 86.085–9 Emission standards for 1985 and later model year light-duty trucks.

(a)(1) The standards set forth in paragraphs (a) through (c) of this section shall apply for trucks sold for principle use at other than a designated high-altitude location. Exhaust emissions from 1985 and later model year light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 0.80 gram per vehicle mile (0.497 gram per vehicle kilometer);

(ii)(A) *Carbon monoxide.* 10 grams per vehicle mile (6.2 grams per vehicle kilometer);

(B) *Gasoline-fueled vehicles.* 0.50 percent of exhaust gas flow at curb idle (gasoline-fueled vehicles only).

(iii) *Oxides of Nitrogen.* 2.3 grams per vehicle mile (1.4 grams per vehicle kilometer);

(iv) *Particulate emissions (diesels only).* 0.60 gram per vehicle mile (0.373 gram per vehicle kilometer);

(2) The standards set forth in paragraphs (a)(1) (i), (ii)(A), (iii), and (iv) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B and measured and calculated in accordance with those procedures. The standard set forth in paragraph (a)(1)(ii)(B) of this section refers to the exhaust emitted at curb idle and measured and calculated in accordance with the procedures set forth in Subpart P of this part.

(b)(1) Fuel evaporative emissions from 1985 and later model year gasoline-fueled light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1985 and later model year light-duty truck.

(d)(1) Model year 1985 and later light-duty trucks sold for principal use at a designated high-altitude location shall be capable of meeting the following exhaust emission standards when tested under high-altitude conditions:

(i) *Hydrocarbons.* 1.0 gram per vehicle mile (0.62 grams per vehicle kilometer);

(ii) *Carbon Monoxide.* 14 grams per vehicle mile (8.7 grams per vehicle kilometer);

(iii) *Oxides of Nitrogen.* 2.3 grams per vehicle mile (1.43 grams per vehicle kilometer);

(2) The standards set forth in paragraph (d)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures.

(e)(1) Fuel evaporative emissions from 1985 and later model year gasoline-fueled light-duty trucks sold for principal use at a designated high-altitude location shall not exceed 2.6 grams per test when tested under high-altitude conditions.

(2) The standard set forth in paragraph (e)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(f) No crankcase emissions shall be discharged into the ambient atmosphere from any 1984 and later model year light-duty trucks sold for principal use at a designated high-altitude location.

(g)(1) Any light-duty truck that a manufacturer wishes to certify for sale at low altitude must be capable of meeting high-altitude emission standards (specified in paragraphs (d) through (f) of this section). The manufacturer may specify vehicle adjustments or modifications to allow the vehicle to meet high-altitude standards but these adjustments or modifications may not alter the vehicle's basic engine, inertia weight class, transmission configuration, and axle ratio.

(i) A manufacturer may certify unique configurations to meet the high-altitude standards but is not required to certify these vehicle configurations to meet the low-altitude standards.

(ii) Any adjustments or modifications that are recommended to be performed on vehicles to satisfy the requirements or paragraph (g)(1) of this section:

(A) Shall be capable of being effectively performed by commercial repair facilities.

(B) Must be included in the manufacturer's application for certification.

(2) The manufacturer may exempt 1985 and later model year vehicles from compliance with the high-altitude emission standards set forth in paragraphs (d) and (e) of this section if the vehicles are not intended for sale at high altitude and if the following requirements are met. A vehicle configuration shall only be considered eligible for exemption if the requirements of either paragraph (g)(2)(i), (ii), (iii), or (iv) of this section are met.

(i) Its design parameters (displacement-to-weight ratio (D/W) and engine speed-to-vehicle-speed ratio (N/V)) fall within the exempted range for that manufacturer for that year. The exempted range is determined according to the following procedure:

(A) The manufacturer shall graphically display the D/W and N/V data of all vehicle configurations it will offer for the model year in question. The axis of the abscissa shall be D/W (where (D) is the engine displacement expressed in cubic centimeters and (W) is the gross vehicle weight (GVW) expressed in pounds), and the axis of the ordinate shall be N/V (where (N) is the crankshaft speed expressed in revolutions per minute and (V) is the vehicle speed expressed in miles per hour). At the manufacturer's option, either the 1:1 transmission gear ratio or the lowest numerical gear ratio available in the transmission will be used to determine N/V. The gear selection must be the same for all N/V data points on the manufacturer's graph. For each transmission/axle ratio combination, only the lowest N/V value shall be used in the graphical display.

(B) The product line is then defined by the equation, $N/V=C(D/W)^{-0.9}$, where the constant, C, is determined by the requirement that all the vehicle data points either fall on the line or lie to the upper right of the line as displayed on the graphs.

(C) The exemption line is then defined by the equation, $N/V=C(0.84\ D/W)^{-0.9}$, where the constant, C is the same as that found in paragraph (g)(2)(i)(B) of this section.

(D) The exempted range includes all values of N/V and D/W which simultaneously fall to the lower left of the exemption line as drawn on the graph.

(ii) Its design parameters fall within the alternate exempted range for that manufacturer that year. The alternate exempted range is determined by substituting rated horsepower (hp) for displacement (D) in the exemption procedure described in paragraph (g)(2)(i) of this section and by using the product line $N/V=C(hp/W)^{-0.9}$.

(A) Rated horsepower shall be determined by using the Society of Automotive Engineers Test Procedure J 1349, or any subsequent version of that test procedure. Any of the horsepower determinants within that test procedure may be used, as long as it is used consistently throughout the manufacturer's product line in any model year.

(B) No exemptions will be allowed under paragraph (g)(2)(ii) of this section to any manufacturer that has exempted vehicle configurations as set forth in paragraph (g)(2)(i) of this section.

(iii) Its acceleration time (the time it takes a vehicle to accelerate from 0 miles per hour to a speed not less than 40 miles per hour and not greater than 50 miles per hour) under high-altitude conditions is greater than the largest acceleration time under low-altitude conditions for that manufacturer for that year. The procedure to be followed in making this determination is:

(A) The manufacturer shall list the vehicle configuration and acceleration time under low-altitude conditions of that vehicle configuration which has the highest acceleration time under low-altitude conditions of all the vehicle configurations it will offer for the model year in question. The manufacturer shall also submit a description of the methodology used to make this determination.

(B) The manufacturer shall then list the vehicle configurations and acceleration times under high-altitude conditions of all those vehicle configurations which have higher acceleration times under high-altitude conditions than the highest acceleration time at low altitude identified in paragraph (g)(2)(iii)(A) of this section.

(iv) In lieu of performing the test procedure of paragraph (g)(2)(iii) of this section, its acceleration time can be estimated based on the manufacturer's engineering evaluation, in accordance with good engineering practice, to meet the exemption criteria of paragraph (g)(2)(iii) of this section.

(3) The sale of a vehicle for principal use at a designated high-altitude location that has been exempted as set forth in paragraph (g)(2) of this section will be considered a violation of section 203(a)(1) of the Clean Air Act.

(Approved by the Office of Management and Budget under control number 2000-0390)

[45 FR 63770, Sept. 25, 1980, as amended at 48 FR 1414, 1427, Jan. 12, 1983; 48 FR 33462, July 21, 1983; 48 FR 48613, Oct. 19, 1983; 48 FR 52185, Nov. 16, 1983; 49 FR 3017, Jan. 24, 1984; 49 FR 48136, Dec. 10, 1984; 50 FR 4514, Jan. 31, 1985]

§ 86.085–10 Emission standards for 1985 and later model year gasoline-fueled heavy-duty engines and vehicles.

(a)(1) Exhaust emissions from new 1984 and later model year gasoline-fueled heavy-duty engines shall not exceed:

(i) *Hydrocarbons.* (A) 1.9 grams per brake horsepower-hour, as measured under the transient operating conditions set forth in paragraph (f)(1) of Appendix I to this part, or,

(B) 2.5 grams per brake horsepower-hour, as measured under the transient operating conditions set forth in paragraph (f)(3) of Appendix I to this part.

(ii) *Carbon monoxide.* (A)(*1*) 37.1 grams per brake horsepower-hour, as measured under the transient operating conditions set forth in paragraph (f)(1) of Appendix I to this part, or,

(*2*) 40.0 grams per brake horsepower-hour, as measured under the transient operating conditions set forth in paragraph (f)(3) of Appendix I to this part.

(B) [Reserved]

(iii) *Oxides of nitrogen.* (A) 10.6 grams per brake horsepower-hour, as measured under the transient operating conditions set forth in paragraph (f)(1) of Appendix I to this part, or,

(B) 10.7 grams per brake horsepower-hour, as measured under the transient operating conditions set forth in paragraph (f)(3) of Appendix I to this part.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over operating schedules set forth in Appendix I to this part, and measured and calculated in accordance with the procedures set forth in Subpart N.

(3)(i) A manufacturer shall select to certify its gasoline-fueled heavy-duty engines using either the operating schedule set forth in paragraph (f)(1) of Appendix I to this part and the emission standards set forth in paragraph (a)(1)(i)(A), (a)(1)(ii)(A)(*1*), and (a)(1)(iii)(A) of this section or, the operating schedule set forth in paragraph (f)(3) of Appendix I to this part and the emission standards set forth in paragraphs (a)(1)(i)(B), (1)(ii)(A)(2), and (1)(ii)(B) of this section.

(ii) All of a manufacturer's gasoline-fueled heavy-duty engine families shall be certified using the same operating schedule and emission standards.

(iii) All official testing of a manufacturer's gasoline-fueled heavy-duty engine families conducted by EPA shall be conducted using the operating schedule and emission standards se lected by that manufacturer at the time of certification.

(b)(1) Evaporative emissions from 1985 and later model year gasoline-fueled heavy-duty vehicles, except as noted in paragraph (b)(3) of this section, shall not exceed:

(i) *Hydrocarbons.* (A) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds, 3.0 grams per test.

(B) For vehicles with a Gross Vehicle Weight Rating of greater than 14,000 pounds, 4.0 grams per test.

(2)(i) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, the standards set forth in paragraph (b)(1) of this section refer to a composite sample of fuel evaporative emissions collected under the conditions set forth in Subpart M and measured in accordance with these procedures.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 26,000 pounds, the standards set forth in paragraph (b)(1)(i)(B) of this section refer to the manufacturer's engineering design evaluation using good engineering practice (a statement of which is required in § 86.085-23(b)(4)(ii)).

(3) Model year 1985 heavy-duty vehicles equipped with model year 1984 gasoline-fueled heavy-duty engines shall not be required to comply with the evaporative emission standards set forth in paragraphs (a) (1) and (2) of this section, nor with the related requirements set forth elsewhere in this subpart.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1985 model year gasoline-fueled heavy-duty engine.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subpart N or P of this part to ascertain that such test engines meet the requirements of paragraphs (a) and (c) of this section.

(e)(1) Nothwithstanding the requirements of paragraphs (a) through (d) of this section, 454 cubic inch displacement (CID) gasoline-fueled heavy-duty engines manufactured by General Motors Corporation may be certified to the following standards for model year 1985, *provided that* the conditions and restrictions of paragraphs (e)(2) through (e)(7) of this section are satisfied:

(i) *Hydrocarbons.* 0.5 grams per brake horsepower hour.

(ii) *Carbon monoxide.* 25 grams per brake horsepower hour.

(iii) *Hydrocarbons plus oxides of nitrogen.* 4.5 grams per brake horsepower hour.

(2) The standards set forth in paragraph (e)(1) of this section refer to the exhaust over operating schedules as set forth in Subpart D and measured and calculated in accordance with those procedures.

(3) Evaporative emissions from vehicles certified under the provisions of paragraph (e) of this section shall not exceed:

(i) *Hydrocarbons.* 2 grams per test.

(ii) The standard set forth in paragraph (e)(3)(i) of this section refers to the manufacturer's engineering design evaluation using good engineering practice (a statement of which is required in § 86.085-23(b)(4)(ii)).

(4) Only 454 CID engines produced by General Motors Corporation, and intended for use in "Class A motorhomes" may be certified under the provisions of paragraph (e) of this section. For the purposes of this paragraph, a "Class A motor home" is defined as "a motor home where the living unit has been entirely constructed on a bare, motor vehicle chassis."

(5) Any 454 CID engines as described in paragraph (e)(4) of this section that are certified for sale in California, in accordance with all applicable California gaseous and evaporative emission standards and test procedures, may be deemed as satisfying the special Federal certification provisions of paragraph (e) of this section.

(6) The manufacturer shall submit to the Administrator all test data and other materials that were submitted to California for approval as described in paragraph (e)(5) of this section. The Administrator, after reviewing this information and determining that all applicable standards and test procedures

for California certification have been met, will issue a Federal certificate of conformity for those engines.

(7) Certification under the provisions of paragraph (e) of this section is limited to model year 1985 engines produced on or after January 1, 1985, and before July 1, 1985.

(8) All requirements applicable to model year 1983 gasoline-fueled heavy-duty engines that do not conflict with the requirements of 1985 model year California certification are applicable to engines certified under the provisions of paragraph (e) of this section.

(9) All engines certified under the special provisions of paragraph (e) of this section shall be labeled in accordance with § 86.085-35(a)(3)(iii)(K), in addition to compliance with all other labeling requirements applicable to gasoline-fueled heavy-duty engines.

(10) All of the provisions of paragraph (e) of this section are void effective July 1, 1985.

[48 FR 1439, Jan. 12, 1983, as amended at 48 FR 52185, Nov. 16, 1983; 49 FR 48136, Dec. 10, 1984; 49 FR 49832, Dec. 21, 1984]

§ 86.085–11 Emission standards for 1985 and later model year diesel heavy-duty engines.

(a)(1) Exhaust emissions from new 1985 and later model year diesel heavy-duty engines shall not exceed the following:

(i) *Hydrocarbons.* 1.3 grams per brake horsepower-hour, as measured under transient operating conditions.

(ii) *Carbon monoxide.* 15.5 grams per brake horsepower-hour, as measured under transient operating conditions.

(iii) *Oxides of nitrogen.* 10.7 grams per brake horsepower-hour, as measured under transient operating conditions.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over the operating schedule set forth in paragraph (f)(2) of Appendix I to this part, and measured and calculated in accordance with the procedures set forth in Subpart N of this part, except as noted in § 86.085-23(c)(2)(i) and (ii).

(b)(1) The opacity of spoke emissions from new 1984 and later model year diesel heavy-duty engines shall not exceed:

(i) 20 percent during the engine acceleration mode.

(ii) 15 percent during the engine lugging mode.

(iii) 50 percent during the peaks in either mode.

(2) The standards set forth in paragraph (b)(1) of this section refer to exhaust smoke emissions generated under the conditions set forth in Subpart I of this part and measured and calculated in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the atmosphere from any new 1985 model year naturally aspirated diesel heavy-duty engine. This provision does not apply to engines using turbochargers, pumps, blowers, or superchargers for air induction.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subpart I or N of this part to ascertain that such test engines meet the requirements of paragraphs (a), (b), and (c) of this section.

[45 FR 4170, Jan. 21, 1980, as amended at 48 FR 52185, Nov. 16, 1983]

§ 86.085–13 Alternative Durability Program.

(a) The procedures of the Alternative Durability Program are optional. Manufacturers may use these optional procedures to determine deterioration factors instead of using the procedures that this subpart otherwise requires.

(b) The optional procedures of the Alternative Durability Program apply only to light-duty vehicles and light-duty trucks, and are effective for the 1985 and later model years. All manufacturers of these vehicles are eligible to participate in this program.

(c) For engine families subject to the procedures of the Alternative Durability Program, the manufacturer shall submit deterioration factors to the Administrator for approval to use them for certification. The Administrator shall approve the use of deterioriation factors that:

(1) The manufacturer attests are representative of the durability performance of its vehicles in actual field use when maintained according to the manufacturer's maintenance instructions (as limited under § 86.084-25(a)), and

(2) Are equal to or greater than the deterioration factors that EPA determines under paragraph (d) of this section.

(d) EPA shall determine minimum deterioration factors for engine families subject to the Alternative Durability Program. This determination shall be based on a procedure of grouping engine families (see § 86.085-24(a)) in order to use historical certification data to determine deterioration factors for each engine family group. The historical data shall be updated yearly through the testing of production durability-data vehicles. Test vehicle requirements under these procedures are contained in § 86.085-24(h) and compliance requirements are contained in § 86.085-28 (a)(5) and (b)(5).

(e) Request Procedures. (1) A manufacturer wishing to participate in the Alternative Durability Program must submit to the Administrator, for each model year, a written request describing the engine families that the manufacturer elects to be included in the program.

(2) The Administrator may declare ineligible any engine family for which the Administrator determines there is unreasonable risk in determining a deterioration factor using the methods of the Alternative Durability Program. Furthermore, the Administrator may limit the number of engine families within the manufacturer's product line that are eligible for the Alternative Durability Program.

(3) Upon approval of the manufacturer's request to participate, the Administrator and the manufacturer may enter into a written agreement prescribing the terms and conditions of the program. This agreement shall be equitable as compared to agreements entered into with other manufacturers. The agreement shall specify the following:

(i) The engine families to be included in the program and the engine family groups that have been established by the provisions of § 86.085-24(a) (8) and (9).

(ii) The procedures for the selection of production durability-data vehicles specified under the provisions of § 86.085-24(h).

(iii) The procedures for the determination of minimum exhaust emission deterioration factors for each engine family group.

(f) Withdrawal from Alternative Durability Program.

(1) Subject to the conditions of the following paragraphs, a manufacturer may, at any time, withdraw all of its product line or separate engine family groups from this program. Only entire engine family groups may be withdrawn.

(2) Once any engine family in an engine family group is certified using deterioration factors determined in the Alternative Durability Program, the manufacturer shall operate and test the production durability-data vehicles specified in § 86.085-24(h) in accordance with the procedures of this part.

(3) The Administrator shall notify the manufacturer if a nonconformity of a category of vehicles within the engine family group is indicated by the production durability data. For the purpose of this paragraph, a nonconformity is determined to exist if:

(i) Any emission-data vehicle within an engine family of the model year most recently certified under the Alternative Durability Program is projected to exceed an emission standard by applying deterioration factors generated by a production durability-data vehicle within the same engine family, or

(ii) Any of the most recent model year's production durability-data vehicle configurations tested under paragraph (f)(2) of this section line crosses as defined in § 86.085-28(a)(5)(ii)(C). For the purpose of this paragraph, data from identical vehicles will be averaged as under § 86.085-28(a)(4)(i) (A) and (B).

(4) If the Administrator notifies a manufacturer of such a nonconformity, the manufacturer shall submit, by a date specified by the Administrator, a plan to remedy the nonconformity which is acceptable to the Director,

Office of Mobile Sources. For the purpose of this paragraph, the term "remedy the nonconformity" will have the same meaning as it does when it appears in section 207(c)(1) of the Clean Air Act.

(5) The manufacturer shall comply with the terms of the remedial plan approved by the Director, Office of Mobile Sources.

(6) If a manufacturer does not comply with the requirements of paragraph (f) (2), (4), or (5) of this section, the Administrator may deem the certificate of conformity for the affected engine families void *ab initio*.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 22548, May 19, 1983]

§ 86.085-20 Incomplete vehicles, classification.

(a) An incomplete truck less than 8,500 pounds gross vehicle weight rating shall be classified by the manufacturer as a light-duty truck or as a heavy-duty vehicle. Incomplete light-duty trucks shall be described in the manufacturer's application for certification. The frontal area and curb weight used for certification purposes shall be specified on the label required in § 86.085-35(d). Incomplete heavy-duty trucks must be labeled as required in § 86.085-35(e) and § 86.085-35(g).

[48 FR 1439, Jan. 12, 1983]

§ 86.085-21 Application for certification.

(a) A separate application for a certificate of conformity shall be made for each set of standards and each class of new motor vehicles or new motor vehicle engines. Such application shall be made to the Administrator by the manufacturer and shall be updated and corrected by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1)(i) Identification and description of the vehicles (or engines) covered by the application and a description of their engine (vehicles only), emission control system and fuel system components. This shall include a detailed description of each auxiliary emission control device (AECD) to be installed in or on any certification test vehicle (or certification test engine).

(ii)(A) The manufacturer shall provide to the Administrator in the application for certification:

(*1*) A list of those parameters which are physically capable of being adjusted (including those adjustable parameters for which access is difficult) and that, if adjusted to settings other than the manufacturer's recommended setting, may affect emissions;

(*2*) A specification of the manufacturer's intended physically adjustable range of each such parameter, and the production tolerances of the limits or stops used to establish the physically adjustable range;

(*3*) A description of the limits or stops used to establish the manufacturer's intended physically adjustable range of each adjustable parameter, or any other means used to inhibit adjustment;

(*4*) The nominal or recommended setting, and the associated production tolerances, for each such parameter.

(B) The manufacturer may provide, in the application for certification, information relating to why certain parameters are not expected to be adjusted in actual use and to why the physical limits or stops used to establish the physically adjustable range of each parameter, or any other means used to inhibit adjustment, are expected to be effective in preventing adjustment of parameters on in-use vehicles to settings outside the manufacturer's intended physically adjustable ranges. This may include results of any tests to determine the difficulty of gaining access to an adjustment or exceeding a limit as intended or recommended by the manufacturer.

(C) The Administrator may require to be provided detailed drawings and descriptions of the various emission related components, and/or hardware samples of such components, for the purpose of making his determination of which vehicle or engine parameter will be subject to adjustment for new certification and Selective Enforcement Audit testing and of the physically adjustable range for each such vehicle or engine parameter.

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles (or engines) for which certification is requested. The sales data shall also include the altitude of intended sale for light-duty trucks.

(3) A description of the test equipment and fuel proposed to be used.

(4)(i) For light-duty vehicles and light-duty trucks, a description of the test procedures to be used to establish the evaporative emission deterioration factors required to be determined and supplied in § 86.085-23(b)(2).

(ii) For gasoline-fueled heavy-duty vehicles, the Administrator does not assume that each evaporative emission family-evaporative emission control system combination will deteriorate in a unique manner during the useful life of the vehicle. The manufacturer shall therefore identify those evaporative emission deterioration factors which shall be applied to the various evaporative emission family-evaporative emission control system combinations which are expected to exhibit similar deterioration characteristics during the useful life of the vehicle.

(iii)(A) A description of the test procedures to be used to establish the durability data or the exhaust emission deterioration factors required to be determined and supplied in § 86.085-23(b)(1).

(B)(*1*) For engine families provided an alternative useful life period under paragraph (f) of this section, a statement of that alternative period and a brief synopsis of the justification.

(*2*) For heavy-duty diesel engine families, a statement of the primary intended service class (light, medium, or heavy) and an explanation as to why that service class was selected. Each diesel engine family shall be certified under one primary intended service class only. After reviewing the guidance in § 86.085-2, the class shall be determined on the basis of which class best represents the majority of the sales of that engine family.

(C)(*1*) For each light-duty truck engine family and each heavy-duty engine family, a statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(*2*) A description of vehicle adjustments or modifications necessary, if any, to assure that light-duty trucks covered by a certificate of conformity conform to the regulations while being operated at any altitude locations, and a statement of the altitude at which the adjustments or modifications apply.

(D) At the option of the manufacturer, the proposed composition of the emission-data test fleet or (where applicable) the durability-data test fleet.

(5)—(6) [Reserved]

(7) For each light-duty vehicle engine family, a statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(8) For each light-duty vehicle engine family, the proposed composition of the emission-data test fleet and the durability-data test fleet.

(c) Complete copies of the application and of any amendments thereto, and all notifications under §§ 86.079-32, 86.079-33, and 86.079-34 shall be submitted in such multiple copies as the Administrator may require.

(d) Incomplete light-duty trucks shall have a maximum completed curb weight and maximum completed frontal area specified by the manufacturer.

(e) For gasoline-fueled heavy-duty vehicles, the manufacturer shall specify a maximum nominal fuel tank capacity for each evaporative emission family-evaporative emission control system combination.

(f) Light-duty truck and heavy-duty engine manufacturers who believe that the useful life periods of § 86.085-2 are significantly unrepresentative for one or more engine families (either too long or too short), may petition the Administrator to provide an alternative useful-life period. This petition must include the full rationale behind the request, together with any supporting data and other evidence. Based on this or other information the Administrator may assign an alternative useful-life period. Any petition should be submitted in a timely manner, to allow adequate time for a thorough evaluation.

(Approved by the Office of Management and Budget under control number 2000–0390)

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[48 FR 1439, Jan. 12, 1983, as amended at 48 FR 33463, July 21, 1983; 48 FR 52186, Nov. 16, 1983; 49 FR 3018, Jan. 24, 1984; 49 FR 48136, Dec. 10, 1984; 52 FR 47863, Dec. 16, 1987]

§ 86.085–22 Approval of application for certification; test fleet selections; determinations of parameters subject to adjustment for certification and selective enforcement audit, adequacy of limits, and physically adjustable ranges.

(a) After a review of the application for certification and any other information which the Administrator may require, the Administrator may approve the application and select a test fleet in accordance with § 86.084–24.

(b) The Administrator may disapprove in whole or in part an application for certification for reasons including incompleteness, inaccuracy, inappropriate proposed mileage (or service) accumulation procedures, test equipment, or fuel, and incorporation of defeat devices in vehicles (or on engines) described by the application.

(c) Where any part of an application is rejected, the Administrator shall notify the manufacturer in writing and set forth the reasons for such rejection. Within 30 days following receipt of such notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If, after the review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078–6 with respect to such issue.

(d)(1) The Administrator does not approve the test procedures for establishing the evaporative emission deterioration factors for light-duty vehicles and light-duty trucks. The manufacturer shall submit the procedures as required in § 86.084–21(b)(4)(i) prior to the Administrator's selection of the test fleet under § 86.084–24(b)(1) and if such procedures will involve testing of durability-data vehicles selected by the Administrator or elected by the manufacturer under § 86.084–24(c)(1), prior to initiation of such testing.

(2) *Light-duty trucks and heavy-duty engines only.* The Administrator does not approve the test procedures for establishing exhaust emission deterioration factors. However, when requested by the Administrator, the manufacturer shall submit these procedures and determinations as required in § 86.085–21 (b)(4)(iii) prior to determining the deterioration factors.

(3) *Gasoline-fueled heavy-duty vehicles only.* The Administrator does not approve the test procedures for establishing the evaporative emission deterioration factors. The test procedure will conform to the requirements in § 86.085–23(b)(3).

(e) When the Administrator selects emission-data vehicles for the test fleet, he will at the same time determine those vehicle or engine parameters which will be subject to adjustment for certification, Selective Enforcement Audit and Production Compliance Audit testing, the adequacy of the limits, stops, seals, or other means used to inhibit adjustment, and the resulting physically adjustable ranges for each such parameter and notify the manufacturer of his determinations.

(1)(i) Except as noted in paragraph (e) (1) (iv) of this section, the Administrator may determine to be subject to adjustment the idle fuel-air mixture parameter on gasoline-fueled vehicles (or engines) (carbureted or fuel injected); the choke valve action parameter(s) on carbureted, gasoline-fueled vehicles (or engines); or any parameter on any vehicle (or engine) (diesel or gasoline-fueled) which is physically capable of being adjusted, may significantly affect emissions, and was not present on the manufacturer's vehicles (or engines) in the previous model year in the same form and function.

(ii) The Administrator may, in addition, determine to be subject to adjustment any other parameters on any vehicle or engine which is physically capable of being adjusted and which may significantly affect emissions. However, the Administrator may do so only if he has previously notified the manufacturer that he might do so and has found, at the time he gave this notice, that the intervening period would be adequate to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period. In no event will this notification be given later than September 1 of the calendar year two years prior to the model year.

(iii) In determining the parameters subject to adjustment the Administrator will consider the likelihood that, for each of the parameters listed in paragraphs (e)(1) (i) and (ii) of this section, settings other than the manufacturer's recommended setting will occur on in-use vehicles (or engines). In determining likelihood, the Administrator may consider such factors as, but not limited to, information contained in the preliminary application, surveillance information from similar in-use vehicles (or engines), the difficulty and cost of gaining access to an adjustment, damage to the vehicle (or engine) if an attempt is made to gain such access and the need to replace parts following such attempt, and the effect of settings other than the manufacturer's recommended setting on vehicle (or engine) performance characteristics including emission characteristics.

(iv) Manual chokes of heavy-duty engines only will not be considered a parameter subject to adjustment under the parameter adjustment requirements.

(2)(i) The Administrator shall determine a parameter to be adequately inaccessible or sealed if:

(A) In the case of an idle mixture screw, the screw is recessed within the carburetor casting and sealed with lead, thermosetting plastic, or an inverted elliptical spacer or sheared off after adjustment at the factory, and the inaccessibility is such that the screw cannot be accessed and/or adjusted with simple tools in one-half hour or for $20 (1978 dollars) or less.

(B) In the case of a choke bimetal spring, the plate covering the bimetal spring is riveted or welded in place, or held in place with nonreversible screws.

(C) In the case of a parameter which may be adjusted by elongating or bending adjustable members (e.g., the choke vacuum break), the elongation of the adjustable member is limited by design or, in the case of a bendable member, the member is constructed of a material which when bent would return to its original shape after the force is removed (plastic or spring steel materials).

(D) In the case of any parameter, the manufacturer demonstrates that adjusting the parameter to settings other than the manufacturer's recommended setting takes more than one-half hour or costs more than $20 (1978 dollars).

(ii) The Administrator shall determine a physical limit or stop to be an adequate restraint on adjustability if:

(A) In the case of a threaded adjustment, the threads are terminated, pinned or crimped so as to prevent additional travel without breakage or need for repairs which take more than one-half hour or cost more than $20 (1978 dollars).

(B) The adjustment is ineffective at the end of the limits of travel regardless of additional forces or torques applied to the adjustment.

(C) The manufacturer demonstrates that travel or rotation limits cannot be exceeded with the use of simple and inexpensive tools (screwdriver, pliers, open-end or box wrenches, etc.) without incurring significant and costly damage to the vehicle (or engine) or control system or without taking more than one-half hour or costing more than $20 (1978 dollars).

(iii) If manufacturer service manuals or bulletins describe routine procedures for gaining access to a parameter or for removing or exceeding a physical limit, stop, seal or other means used to inhibit adjustment, or if surveillance data indicate that gaining access, removing, or exceeding is likely, paragraphs (e)(2) (i) and (ii) of this section shall not apply for that parameter.

(iv) In determining the adequacy of a physical limit, stop, seal, or other means used to inhibit adjustment of a parameter not covered by paragraph (e)(2)(i) or (e)(2)(ii) of this section, the Administrator will consider the likelihood that it will be circumvented, removed, or exceeded on in-use vehicles. In determining likelihood, the Administrator may consider such factors as, but not limited to, information contained in the preliminary application; surveillance information from similar in-use vehicles (or engines); the difficulty and cost of circumventing, removing, or exceeding the limit, stop, seal, or other means; damage to the vehicle (or engine) if an attempt is made to circumvent, remove, or exceed it and the need to replace parts following such attempt; and the effect of settings beyond the limit, stop, seal, or other means on vehicle (or engine) performance characteristics other than emission characteristics.

(3) The Administrator shall determine two physically adjustable ranges for each parameter subject to adjustment:

(i)(A) In the case of a parameter determined to be adequately inaccessible or sealed, the Administrator may include within the physically adjustable range applicable to testing under this subpart (certification testing) all settings within the production tolerance associated with the nominal setting for that parameter, as specified by the manufacturer in the preliminary application for certification.

(B) In the case of other parameters, the Administrator shall include within this range all settings within physical limits or stops determined to be adequate restraints on adjustability. The Administrator may also include the production tolerances on the location of these limits or stops when determining the physically adjustable range.

(ii)(A) In the case of a parameter determined to be adequately inaccessible or sealed, the Administrator shall include within the physically adjustable range applicable to testing under Subpart G, K or L (Selective Enforcement Audit and Production Compliance Audit) only the actual setting to which the parameter is adjusted during production.

(B) In the case of other parameters, the Administrator shall include within this range all settings within physical limits or stops determined to be adequate restraints on adjustability, as they are actually located on the test vehicle (or engine).

(f)(1) If the manufacturer submits the information specified in § 86.084-21(b) (1)(ii) in advance of its full preliminary application for certification, the Administrator shall review the information and make the determinations required in paragraph (e) of this section within 90 days of the manufacturer's submittal.

(2) The 90-day decision period is exclusive of the elapsed time during which EPA may request additional information from manufacturers regarding an adjustable parameter and the receipt of the manufacturers' response(s).

(g) Within 30 days following receipt of notification of the Administrator's determinations made under paragraph (e) of this section, the manufacturer may request a hearing on the Administrator's determinations. The request shall be in writing, signed by an authorized representative of the manufacturer, and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If, after review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078-6 with respect to such issue.

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§ 86.085-23 Required data.

(a) The manufacturer shall perform the tests required by the applicable test procedures, and submit to the Administrator the following information: *Provided, however,* That if requested by the manufacturer, the Administrator may waive any requirement of this section for testing of vehicle (or engine) for which emission data are available or will be made available under the provisions of § 86.081-29.

(b)(1)(i) Exhaust emission durability data on such light-duty vehicles tested in accordance with applicable test procedures and in such numbers as specified, which will show the performance of the systems installed on or incorporated in the vehicle for extended mileage, as well as a record of all pertinent maintenance performed on the test vehicles.

(ii) Exhaust emission deterioration factors for light-duty trucks and heavy-duty engines and all test data that are derived from the testing described under § 86.085-21(b)(4)(iii)(A) as well as a record of all pertinent maintenance. Such testing shall be designed and conducted in accordance with good engineering practice to assure that the engines covered by a certificate issued under § 86.085-30 will meet the emission standards in § 86.085-09, § 86.085-10, or § 86.085-11, as appropriate, in actual use for the useful life of the engine.

(2) For light-duty vehicles and light-duty trucks, evaporative emission deterioration factors for each evaporative emission family-evaporative emission control system combination and all test data that are derived from testing described under § 86.084-21(b)(4)(i) designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.084-30 will meet the evaporative emission standards in § 86.081-8 or § 86.084-9, as appropriate, for the useful life of the vehicle.

(3) For gasoline-fueled heavy-duty vehicles, evaporative emission deterioration factors for each evaporative emission family-evaporative emission control system combination identified in accordance with § 86.085-21(b)(4)(ii). Furthermore, a statement that the test procedure(s) used to derive the deterioration factors includes, but need not be limited to, a consideration of the ambient effects of ozone and temperature fluctuations, and the service accumulation effects of vibration, time, and vapor saturation and purge cycling. The deterioration factor test procedure shall be designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.085-30 will meet the evaporative emission standards in § 86.085-10 in actual use for the useful life of the engine. Furthermore, a statement that a description of the test procedure, as well as all data, analyses and evaluations, is available to the Administrator upon request.

(4)(i) For gasoline-fueled, heavy-duty vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, a written statement to the Administrator certifying that the manufacturer's vehicles meet the standards of § 86.085-10 as determined by the provisions of § 86.085-28. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations, and other documents, on which the above statement is based, are available to the Administrator upon request.

(ii) For gasoline-fueled, heavy-duty vehicles with a Gross Vehicle Weight Rating of greater than 26,000 pounds, a written statement to the Administrator certifying that the manufacturer's evaporative emission control systems are designed, using good engineering practice, to meet the standards of § 86.085-10 as determined by the provisions of § 86.085-28. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations, and other documents, on which the above statement is based, are available to the Administrator upon request.

(c) *Emission data.* (1)(i) Emission data on such vehicles tested in accordance with applicable test procedures and in such numbers as specified. These data shall include zero-mile data, if generated, and emission data generated for certification as required under § 86.084–26(a)(3)(i) or § 86.084–26(a)(3)(ii).

(2) *Certification engines.* (i) Emission data on such engines tested in accordance with applicable emission test procedures of this subpart and in such numbers as specified. These data shall include zero-hour data, if generated, and emission data generated for certification as required under § 86.082–26(b)(5). In lieu of providing emission data on CO emissions from diesel certification engines the Administrator may, on request of the manufacturer, allow the manufacturer to demonstrate (on the basis of previous emission tests, development tests, or other information) that the engine will conform with the CO emission standard of § 86.085–11.

(ii) For heavy-duty diesel engines, a manufacturer may submit hot-start data only, in accordance with Subpart N, when making application for certification. However, for confirmatory, SEA, and recall testing by the Agency, both the cold-start and hot-start test data, as specified in Subpart N, will be included in the official results.

(d) A statement that the vehicles (or engines) for which certification is requested conform to the requirements in § 86.084–5(b), and that the descriptions of tests performed to ascertain compliance with the general standards in § 86.084–5(b), and the data derived from such tests, are available to the Administrator upon request.

(e)(1) A statement that the test vehicles (or test engines) with respect to which data are submitted to demonstrate compliance with the applicable standards of this subpart are in all material respects as described in the manufacturer's application for certification, have been tested in accordance with the applicable test procedures utilizing the fuels and equipment described in the application for certification and that on the basis of such tests the vehicles (or engines) conform to the requirements of this part. If such statements cannot be made with respect to any vehicle (or engine) tested, the vehicle (or engine) shall be identified, and all pertinent data relating thereto shall be supplied to the Administrator. If, on the basis of the data supplied and any additional data as required by the Administrator, the Administrator determines that the test vehicle (or test engine) was not as described in the application for certification or was not tested in accordance with the applicable test procedures utilizing the fuels and equipment as described in the application for certification, the Administrator may make the determination that the vehicle (or engine) does not meet the applicable standards. The provisions of § 86.085–30(b) shall then be followed.

(2) For evaporative emission durability, or light-duty truck or heavy-duty engine exhaust emission durability, a statement of compliance with paragraph (b)(2), (b)(3) or (b)(1)(ii) of this section, as applicable.

(f) If the manufacturer elects to use a measurement procedure other than that specified in Subpart I to determine compliance with the standards of § 86.085–11(b), the manufacturer will:

(1) Determine the correlation between the alternative measurement procedure chosen and the procedure set forth in Subpart I for each of the opacity measurements required in § 86.085–11(b).

(2) Maintain a description of the procedure and test(s) used to determine the correlation and the data derived from such tests.

(3) Make available to the Administrator, upon request, any of the information or data required in paragraphs (f) (1) and (2), and

(4) For each engine family for which a certificate is requested:

(i) Provide a statement that the results obtained by the alternative measurement procedure correlate with the results which would be expected when determined by the procedure in Subpart I, and

(ii) Provide these results, adjusted if necessary with the applicable correlation offset, to be compared with the opacity standards of § 86.085–11(b).

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§ 86.085-24 Test vehicles and engines.

(a)(1) The vehicles or engines covered by an application for certification will be divided into groupings of engines which are expected to have similar emission characteristics throughout their useful life. Each group of engines with similar emission characteristics shall be defined as a separate engine family.

(2) To be classed in the same engine family, engines must be identical in all the following respects:

(i) The cylinder bore center-to-center dimensions.

(ii)–(iii) [Reserved]

(iv) The cylinder block configuration (air cooled or water cooled; L-6, 90° V-8, etc.).

(v) The location of the intake and exhaust valves (or ports).

(vi) The method of air aspiration.

(vii) The combustion cycle.

(viii) Catalytic converter characteristics.

(ix) Thermal reactor characteristics.

(x) Type of air inlet cooler (e.g., intercoolers and after-coolers) for diesel heavy-duty engines.

(3)(i) Engines identical in all the respects listed in paragraph (a)(2) of this section may be further divided into different engine families if the Administrator determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(A) The bore and stroke.

(B) The surface-to-volume ratio of the nominally dimensioned cylinder at the top dead center positions.

(C) The intake manifold induction port size and configuration.

(D) The exhaust manifold port size and configuration.

(E) The intake and exhaust valve sizes.

(F) The fuel system.

(G) The camshaft timing and ignition or injection timing characteristics.

(ii) Light-duty trucks and heavy-duty engines produced in different model years and distinguishable in the respects listed in paragraph (a)(2) of this section shall be treated as belonging to a single engine family if the Administrator requires it, after determining that the engines may be expected to have similar emission deterioration characteristics.

(4) Where engines are of a type which cannot be divided into engine families based upon the criteria listed in paragraphs (a) (2) and (3) of this section, the Administrator will establish families for those engines based upon those features most related to their emission characteristics. Engines that are eligible to be included in the same engine family based on the criteria in paragraphs (a) (2) and (3)(i) of this section may be further divided into different engine families if the manufacturer determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(i) The dimension from the center line of the crankshaft to the center line of the camshaft.

(ii) The dimension from the center line of the crankshaft to the top of the cylinder block head face.

(iii) The size of the intake and exhaust valves (or ports).

(5) The gasoline-fueled light-duty vehicles and light-duty trucks covered by an application for certification will be divided into groupings which are expected to have similar evaporative emission characteristics throughout their useful life. Each group of vehicles with similar evaporative emission characteristics shall be defined as a separate evaporative emission family.

(6) For gasoline-fueled light-duty vehicles and light-duty trucks to be classed in the same evaporative emission family, vehicles must be similar with respect to:

(i) Type of vapor storage device (e.g., canister, air cleaner, crankcase).

(ii) Basic canister design.

(iii) Fuel system.

(7) Where vehicles are of a type which cannot be divided into evaporative emission families based on the criteria listed above, the Administrator will establish families for those vehicles based upon the features most related to their evaporative emission characteristics.

(8)(i) If the manufacturer elects to participate in the Alternative Durability Program, the engine families covered by an application for certification shall be grouped based upon similar engine design and emission control system characteristics. Each of these groups shall constitute a separate engine family group.

(ii) To be classed in the same engine family group, engine families must contain engines identical in all of the following respects:

(A) The combustion cycle.

(B) The cylinder block configuration (air-cooled or water-cooled; L–6, V–8, rotary, etc.).

(C) Displacement (engines of different displacement within 50 cubic inches or 15 percent of the largest displacement and contained within a multidisplacement engine family will be included in the same engine family group).

(D) Catalytic converter usage and basic type (noncatalyst, oxidation catalyst only, three-way catalyst equipped).

(9) Engine families identical in all respects listed in paragraph (a)(8) of this section may be further divided into different engine family groups if the Administrator determines that they are expected to have significantly different exhaust emission control system deterioration characteristics.

(10) A manufacturer may request the Administrator to include in an engine family group, engine families in addition to those grouped under the provisions of paragraph (a)(8) of this section. This request must be accompanied by information the manufacturer believes supports the inclusion of these additional engine families.

(11) A manufacturer may combine into a single engine family group those light-duty vehicle and light-duty truck engine families which otherwise meet the requirements of paragraphs (a) (8) through (10) of this section.

(12) The gasoline-fueled heavy-duty vehicles covered by an application for certification will be divided into groupings of vehicles on the basis of physical features which are expected to affect evaporative emissions. Each group of vehicles with similar features shall be defined as a separate evaporative emission family.

(13) For gasoline-fueled heavy-duty vehicle to be classed in the same evaporative emission family, vehicles must be identical with respect to:

(i) Method of fuel/air metering (i.e., carburetion versus fuel injection).

(ii) Carburetor bowl fuel volume, within a 10 cc range.

(14) For gasoline-fueled heavy-duty vehicles to be classed in the same evaporative emission control system, vehicles must be identical with respect to:

(i) Method of vapor storage.

(ii) Method of carburetor sealing.

(iii) Method of air cleaner sealing.

(iv) Vapor storage working capacity, within a 20g range.

(v) Number of storage devices.

(vi) Method of purging stored vapors.

(vii) Method of venting the carburetor during both engine off and engine operation.

(viii) Liquid fuel hose material.

(ix) Vapor storage material.

(15) Where gasoline-fueled heavy-duty vehicles are types which cannot be divided into evaporative emission family-control system combinations based on the criteria listed above, the Administrator will establish evaporative emission family-control system combinations for those vehicles based on features most related to their evaporative emission characteristics.

(b) Emission data:

(1) *Emission-data vehicles.* Paragraph (b)(1) of this section applies to light-duty vehicle and light-duty truck emission-data vehicles.

(i) Vehicles will be chosen to be operated and tested for emission data based upon engine family groupings. Within each engine family, one test vehicle will be selected based on the following criteria: The Administrator shall select the vehicle with the heaviest equivalent test weight (including options) within the family. Then within that vehicle the Administrator shall select, in the order listed, the highest road-load power, largest displacement, the transmission with the highest numerical final gear ratio (including overdrive), the highest numerical axle ratio offered in that engine family and the maximum fuel flow calibration.

(ii) The Administrator shall select one additional test vehicle from within each engine family. The vehicle selected shall be the vehicle expected to exhibit the highest emissions of those vehicles remaining in the engine family. If all vehicles within the engine family are similar the Administrator may waive the requirements of this paragraph.

(iii) Within an engine family and exhaust emission control system, the manufacturer may alter any emission-data vehicle (or other vehicles such as including current or previous model year emission-data vehicles, fuel economy data vehicles, and development vehicles provided they meet emission-data vehicles' protocol) to represent more than one selection under paragraph (b)(1) (i), (ii), (iv), or (vii) of this section.

(iv) If the vehicles selected in accordance with paragraphs (b)(1) (i) and (ii) of this section do not represent each engine-system combination, then one vehicle of each engine-system combination not represented will be selected by the Administrator. The vehicle selected shall be the vehicle expected to exhibit the highest emissions of those vehicles remaining in the engine family.

(v) For high-altitude exhaust emission compliance for each engine family, the manufacturer shall follow one of the following procedures:

(A) The manufacturer will select for testing under high-altitude conditions the vehicle expected to exhibit the highest emissions from the nonexempt vehicles selected in accordance with § 86.084-24(b)(1) (ii), (iii), and (iv) of this section or,

(B) In lieu of testing vehicles according to paragraph (b)(1)(v)(A) of this section, a manufacturer may provide a statement in its application for certification that, based on the manufacturer's engineering evaluation of such high-altitude emission testing as the manufacturer deems appropriate,

(*1*) That all light-duty vehicles not exempt under § 86.085-8(h) comply with the emission standards at high altitude, and

(*2*) That light-duty trucks sold for principal use at designated high-altitude locations comply with the high-altitude emission requirements, and that all light-duty trucks sold at low altitude, which are not exempt under § 86.085-9(g)(2), are capable of being modified to meet high-altitude standards.

(vi) If 90 percent or more of the engine family sales will be in California, a manufacturer may substitute emission-data vehicles selected by the California Air Resources Board criteria for the selections specified in paragraphs (b)(1)(i), (b)(1)(ii), and (b)(1)(iv) of this section.

(vii)(A) Vehicles of each evaporative emission family will be divided into evaporative emission control systems.

(B) The Administrator will select the vehicle expected to exhibit the highest evaporative emissions, from within each evaporative family to be certified, from among the vehicles represented by the exhaust emission-data selections for the engine family, unless evaporative testing has already been completed on the vehicle expected to exhibit the highest evaporative emissions for the evaporative family as part of another engine family's testing.

(C) If the vehicles selected in accordance with paragraph (b)(1)(vii)(B) of this section do not represent each evaporative emission control system then the Administrator will select the highest expected evaporative emission vehicle from within the unrepresented evaporative system.

(viii) For high-altitude evaporative emission compliance for each evaporative emission family, the manufacturer shall follow one of the following procedures:

(A) The manufacturer will select for testing under high-altitude conditions the one nonexempt vehicle previously selected under paragraph (b)(1)(vii) (B) or (C) of this section which is expected to have the highest level of evaporative emissions when operated at high altitude or

(B) In lieu of testing vehicles according to paragraph (A) of this section, a manufacturer may provide a statement in its application for certification that based on the manufacturer's engineering evaluation of such high-altitude emission testing as the manufacturer deems appropriate, (*1*) That all light-duty vehicles not exempt under § 86.085–8(h) comply with the emission standards at high altitude, and

(*2*) That light-duty trucks sold for principal use at designated high-altitude locations comply with the high-altitude emission requirements, and that all light-duty trucks sold at low altitude, which are not exempt under § 86.085–9(g)(2), are capable of being modified to meet high-altitude standards.

(ix) Vehicles selected under paragraph (b)(1)(v)(A) of this section may be used to satisfy the requirements of (b)(1)(viii)(A) of this section.

(x) (Light-Duty Trucks Only) (A) The manufacturer may reconfigure any of the low-altitude emission-data vehicles to represent the vehicle configuration required to be tested at high altitude.

(B) The manufacturer is not required to test the reconfigured vehicle at low altitude.

(2) *Gasoline-fueled heavy-duty emission-data engines.* Paragraph (b)(2) of this section applies to gasoline-fueled heavy-duty engines.

(i)—(ii) [Reserved]

(iii) The Administrator shall select a maximum of two engines within each engine family based upon features indicating that they may have the highest emission levels of the engines in the engine family as follows:

(A) The Administrator shall select one emission-data engine first based on the largest displacement within the engine family. Then within the largest displacement the Administrator shall select, in the order listed, highest fuel flow at the speed of maximum rated torque, the engine with the most advanced spark timing, no EGR or lowest EGR flow, and no air pump or lowest actual flow air pump.

(B) The Administrator shall select one additional engine, from within each engine family. The engine selected shall be the engine expected to exhibit the highest emissions of those engines remaining in the engine family. If all engines within the engine family are similar the Administrator may waive the requirements of this paragraph.

(iv) If the engines selected in accordance with paragraphs (b)(2) (ii) and (iii) of this section do not represent each engine displacement-exhaust emission control system combination, then one engine of each engine displacement-exhaust emission control system combination not represented shall be selected by the Administrator.

(v) Within an engine family/displacement/control system combination, the manufacturer may alter any emission-data engine (or other engine including current or previous model year emission-data engines and development engines provided they meet the emission-data engines' protocol) to represent more than one selection under paragraph (b)(2)(iii) of this section.

(3) *Diesel heavy-duty emission-data engines.* Paragraph (b)(3) of this section applies to diesel heavy-duty emission-data vehicles.

(i) Engines will be chosen to be run for emission data based upon engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Engines of each engine family will be divided into groups based upon their exhaust emission control systems. One engine of each engine system combination shall be run for smoke emission data and gaseous emission data. Either the complete gaseous emission test or the complete smoke test may be conducted first. Within each combination, the engine that features the highest fuel feed per stroke, primarily at the speed of maximum rated torque and secondarily at rated speed, will usually be selected. If there are military engines with higher fuel rates than other engines in the same engine system combinations, then one military engine shall also be selected. The engine with the highest fuel feed per stroke will usually be selected.

(iii) The Administrator may select a maximum of one additional engine within each engine-system combination based upon features indicating that it may have the highest emission levels of the engines of that combination. In selecting this engine, the Administrator will consider such features as the injection system, fuel system, compression ratio, rated speed, rated horsepower, peak torque speed, and peak torque.

(iv) Within an engine family control system combination, the manufacturer may alter any emission-data engine (or other engine such as including current or previous model year emission-data engines and development engines provided they meet the emission-data engines' protocol) to represent more than one selection under paragraphs (b)(3)(ii) and (iii) of this section.

(c) *Durability data*—(1) *Light-duty vehicle durability-data vehicles.* Paragraph (c)(1) of this section applies to light-duty vehicle durability-data vehicles.

(i) A durability-data vehicle will be selected by the Administrator to represent each engine-system combination. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with that control-system combination in that engine family and will be designated by the Administrator as to transmission type, fuel system, inertia weight class, and test weight.

(ii) A manufacturer may elect to operate and test additional vehicles to represent any engine-system combination. The additional vehicles must be of the same engine displacement, transmission type, fuel system and inertia weight class as the vehicle selected for tha. engine-system combination in accordance with the provisions of paragraph (c)(1)(i) of this section. Notice of an intent to operate and test additional vehicles shall be given to the Administrator no later than 30 days following notification of the test fleet selection.

(2) *Light-duty trucks.* Paragraph (c)(2) of this section applies to vehicles, engines, subsystems, or components used to establish exhaust emission deterioration factors for light-duty trucks.

(i) The manufacturer shall select the vehicles, engines, subsystems, or components to be used to determine exhaust emission deterioration factors for each engine-family control system combination. Whether vehicles, engines, subsystems, or components are used, they shall be selected so that their emissions deterioration characteristics may be expeced to represent those of in-use vehicles, based on good engineering judgment.

(3) *Heavy-duty engines.* Paragraph (c)(3) of this section applies to engines, subsystems, or components used to establish exhaust emission deterioration factors for heavy-duty engines.

(i) The manufacturer shall select the engines, subsystems, or components to be used to determine exhaust emission deterioration factors for each engine-family control system combination. Whether engines, subsystems, or components are used, they shall be selected so that their emissions deterioration characteristics may be expected to represent those of in-use engines, based on good engineering judgment.

(d) For purposes of testing under § 86.084-26 (a)(9) or (b)(11), the Administrator may require additional emission-data vehicles (or emission-data engines) and durability-data vehicles (light-duty vehicles only) identical in all material respects to vehicles (or engines) selected in accordance with paragraphs (b) and (c) of this section, *Provided,* That the number of vehicles (or engines) selected shall not increase the size of either the emission-data fleet or the durability-data fleet by more than 20 percent or one vehicle (or engine), whichever is greater.

(e)(1) Any manufacturer whose projected sales for the model year in which certification is sought is less than:

(i) 2,000 gasoline-fueled light-duty vehicles, or

(ii) 2,000 diesel light-duty vehicles, or

(iii) 2,000 gasoline-fueled light-duty trucks, or

(iv) 2,000 diesel light-duty trucks, or

(v) 2,000 gasoline-fueled heavy-duty engines, or

(vi) 2,000 diesel heavy-duty engines, may request a reduction in the number of test vehicles (or engines) determined in accordance with the foregoing provisions of this section. The Administrator may agree to such lesser number as he determines would meet the objectives of this procedure.

(2) Any manufacturer may request to certify engine families with combined total sales of fewer than 10,000 light-duty vehicles, light-duty trucks, and heavy-duty engines utilizing as-

signed deterioration factors prescribed by the Administrator. The assigned deterioration factors shall be applied only to entire engine families.

(f) In lieu of testing an emission-data or durability-data vehicle (or engine) selected under paragraph (b) or (c) of this section, and submitting data therefor, a manufacturer may, with the prior written approval of the Administrator, submit exhaust emission data and/or fuel evaporative emission data, as applicable on a similar vehicle (or engine) for which certification has previously been obtained or for which all applicable data required under § 86.084–23 has previously been submitted.

(g)(1) This paragraph applies to light-duty vehicles and light-duty trucks, but does not apply to the production vehicles selected under paragraph (h) of this section.

(2)(i) Where it is expected that more than 33 percent of a carline, within an engine-system combination, may be equipped with an item (whether that item is standard equipment or an option), the full estimated weight of that item shall be included in the curb weight computation of each vehicle available with that item in that carline, within that engine-system combination.

(ii) Where it is expected that 33 percent or less of the carline, within an engine-system combination, will be equipped with an item (whether that item is standard equipment of an option), no weight for that item will be added in computing the curb weight for any vehicle in that carline, within that engine-system combination, unless that item is standard equipment on the vehicle.

(iii) In the case of mutually exclusive options, only the weight of the heavier option will be added in computing the curb weight.

(iv) Optional items weighing less than three pounds per item need not be considered.

(3)(i) Where it is expected that more than 33 percent of a carline, within an engine-system combination, will be equipped with an item (whether that item is standard equipment or an option) that can reasonably be expected to influence emissions, then such items shall actually be installed (unless excluded under paragraph (g)(3)(ii) of this section) on all emission-data and durability-data vehicles of that carline, within that engine-system combination, on which the items are intended to be offered in production. Items that can reasonably be expected to influence emissions are: air conditioning, power steering, power brakes, and other items determined by the Administrator.

(ii) If the manufacturer determines by test data or engineering evaluation that the actual installation of the optional equipment required by paragraph (g)(3)(i) of this section does not affect the emissions or fuel economy values, the optional equipment need not be installed on the test vehicle.

(iii) The weight of the options shall be included in the design curb weight and also be represented in the weight of the test vehicles.

(iv) The engineering evaluation, including any test data, used to support the deletion of optional equipment from test vehicles, shall be maintained by the manufacturer and shall be made available to the Administrator upon request.

(4) Where it is expected that 33 percent or less of a carline within an engine-system combination will be equipped with an item (whether that item is standard equipment or an option) that can reasonably be expected to influence emissions, that item shall not be installed on any emission-data vehicle or durability-data vehicle of that carline, within that engine-system combination, unless that item is standard equipment on that vehicle or specifically required by the Administrator.

(h) *Alternative Durability Program durability-data vehicles.* This section applies to light-duty vehicle and light-duty truck durability-data vehicles selected under the Alternative Durability Program described in § 86.085–13.

(1) In order to update the durability data to be used to determine a deterioration factor for each engine family group, the Administrator will select durability-data vehicles from the manufacturer's production line. Production vehicles will be selected from each model year's production for those ve-

hicles certified using the Alternative Durability Program procedures.

(i) The Administrator shall select the production durability-data vehicle designs from the designs that the manufacturer offers for sale. For each model year and for each engine family group, the Administrator may select production durabilty-data vehicle designs of equal number to the number of engine families within the engine family group, up to a maximum of three vehicles.

(ii) The production durability-data vehicles representing the designs selected in paragraph (h)(1)(i) of this section will be randomly selected from the manufacturer's production. The Administrator will make these random selections unless the manufacturer (with prior approval of the Administrator) elects to make the random selections.

(iii) The manufacturer may select additional production durability-data vehicle designs from within the engine family group. The production durability-data vehicles representing these designs shall be randomly selected from the manufacturer's production in accordance with paragraph (h)(1)(ii) of this section.

(iv) For each production durability-data vehicle selected under paragraph (h)(1) of this section, the manufacturer shall provide to the Administrator (before the vehicle is tested or begins service accumulation) the vehicle identification number. Before the vehicle begins service accumulation the manufacturer shall also provide the Administrator with a description of the durability-data vehicle as specified by the Administrator.

(v) In lieu of testing a production durability-data vehicle selected under paragraph (h)(1) of this section, and submitting data therefore, a manufacturer may, with the prior written approval of the Administrator, submit exhaust emission data from a production vehicle of the same configuration for which all applicable data has previously been submitted.

(2) If, within an existing engine family group, a manufacturer requests to certify vehicles of a new design, engine family, emission control system, or with any other durability-related design difference, the Administrator will determine if the existing engine family group deterioration factor is appropriate for the new design. If the Administrator cannot make this determination or deems the deterioration factor not appropriate, the Administrator shall select preproduction durability-data vehicles under the provisions of paragraph (c) of this section. If vehicles are then certified using the new design, the Administrator may select production vehicles with the new design under the provisions of paragraph (h)(1) of this section.

(3) If a manufacturer requests to certify vehicles of a new design that the Administrator determines are a new engine family group, the Administrator shall select preproduction durability-data vehicles under the provisions of paragraph (c) of this section. If vehicles are then certified using the new design, the Administrator may select production vehicles of that design under the provisions of paragraph (h)(1) of this section.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 1443, Jan. 12, 1983, as amended at 48 FR 22549, May 19, 1983; 48 FR 48614, Oct. 19, 1983; 49 FR 48137, Dec. 10, 1984]

§ 86.085-25 Maintenance.

(a) *Light-duty vehicles.* Paragraph (a) of this section applies to light-duty vehicles.

(1) Scheduled maintenance on the engine, emission control system, and fuel system of durability-data vehicles, selected by the Administrator or elected by the manufacturer under § 86.084-24(c)(1), shall be scheduled for performance during durability testing at the same mileage intervals that will be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle. This maintenance schedule may be updated as necessary throughout the durability-data vehicle's testing provided that no maintenance operation is deleted from the maintenance schedule after the operation has been performed on the test vehicle. Such maintenance shall be

performed, except as provided in paragraph (a)(5)(iii) of this section, only under the following provisions:

(i) Scheduled major engine tuneups to manufacturer's specifications may be performed no more frequently than every 12,500 miles of scheduled driving: Provided that no tuneup may be performed after 45,000 miles of scheduled driving. A scheduled major engine tuneup shall be restricted to paragraph (a)(1)(i) (A) or (B) of this section, and shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by customer service personnel.

(A) *For gasoline-fueled vehicles*, the following items may be inspected, replaced, cleaned, adjusted, and/or serviced as required:

(*1*) Ignition system.

(*2*) Cold starting enrichment system (includes fast idle speed setting).

(*3*) Curb idle speed and air/fuel mixture.

(*4*) Drive belt tension on engine accessories.

(*5*) Valve lash.

(*6*) Inlet air and exhaust gas control valves.

(*7*) Engine bolt torque.

(*8*) Spark plugs.

(*9*) Fuel filter and air filter.

(*10*) Crankcase emission control system.

(*11*) Fuel evaporative emission control system.

(B) *For diesel vehicles*, a major engine tuneup shall be restricted to the following:

(*1*) Adjust low idle speed.

(*2*) Adjust valve lash if required.

(*3*) Adjust injector timing.

(*4*) Adjust governor.

(*5*) Clean and service injector tips.

(*6*) Adjust drive belt tension on engine accessories.

(*7*) Check engine bolt torque and tighten as required.

(ii) Change of engine and transmission oil, and change or service of oil filter will be allowed at the same mileage intervals that will be specified in the manufacturer's maintenance instructions.

(iii) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to adjustment during scheduled major engine tuneups, once during the first 5,000 miles of vehicle operation.

(2)(i) *For gasoline-fueled vehicles* unscheduled maintenance on the engine, emission control system, and fuel system of durability vehicles may be performed, except as provided in paragraph (a)(5)(i) of this section, only under the following provisions:

(A) Any persistently misfiring spark plug may be replaced, in addition to replacement at scheduled major engine tuneup points.

(B) Readjustment of the engine cold starting enrichment system may be performed if there is a problem of stalling or if there is visible black smoke.

(C) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to that performed as scheduled maintenance under paragraph (a)(1) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 30 rpm or more, or if there is a problem of stalling.

(D) The idle mixture may be reset other than during scheduled major engine tuneups, only with the advance approval of the Administrator.

(ii) *For diesel vehicles*, unscheduled maintenance on the engine emission control system, and fuel system of durability-data vehicles may be performed, except as provided in paragraph (a)(5)(i) of this section, only under the following provisions:

(A) Injectors may be changed if a persistent misfire is detected.

(B) Readjustment of the engine idle speed (curb idle and fast idle) may be performed in addition to that performed as scheduled maintenance under paragraph (a)(1) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 3 rpm or more, or if there is a problem of stalling.

(3) An exhaust gas recirculation (EGR) system may be serviced during durability testing only under one of the following provisions:

(i) Manufacturers may schedule service to the EGR system at the scheduled major engine tuneup, if an audible and/or visible signal approved by the Administrator alerts the ve cle operator to the need for EGR system maintenance at each of those mileage points. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(ii) Manufacturers may service the EGR system a maximum of three times during the 50,000 miles either at a scheduled major engine tuneup point or as unscheduled maintenance, if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for EGR system maintenance. The signal may be activated either by EGR system failure (unscheduled maintenance) or need for scheduled periodic maintenance. If maintenance is performed, the signal for scheduled periodic maintenance shall be reset. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(iii) Manufacturers may schedule service to the EGR system at the scheduled major engine tuneup(s) if failure to perform EGR system maintenance is not likely, as determined by the Administrator, to result in an improvement in vehicle performance. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(4) The catalytic converter may be serviced once during 50,000 miles if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for maintenance. The signal may be activated either by component failure or need for maintenance at a scheduled point.

(5) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability-data vehicles shall be performed only with the advance approval of the Administrator.

(i) In the case of unscheduled maintenance, such approval will be given if the Administrator:

(A) Has made a preliminary determination that part failure or system malfunction, or the repair of such failure or malfunction, does not render the vehicle unrepresentative of vehicles in use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement; and

(B) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, vehicle stalling, overheating, fluid leakage, loss of oil pressure, or charge indicator warning. For the evaporative emission control system this overt indication may be indicated by such items as fuel odor or fluid leakage.

(ii) Emission measurement may not be used as a means of determining the need for unscheduled maintenance under paragraph (a)(5)(i) of this section except under the conditions outlined in paragraph (a)(5)(ii)(A) of this section.

(A) *Conditions for unscheduled maintenance based upon emission results.* The Administrator may approve unscheduled maintenance on durability-data vehicles based upon a significant change in emission levels that indicates a vehicle malfunction. In these cases the Administrator may first approve specific diagnostic procedures to identify the source of the problem. The Administrator may further approve specific corrections to the problem after the problem has been identified. The Administrator may only approve the corrective action if the Administrator determines that:

(*1*) The malfunction was caused by nonproduction build practices or by a previously undetected design problem,

(*2*) The malfunction will not occur in production vehicles in use, *and*

(*3*) The deterioration factor generated by the durability-data vehicle will remain unaffected by the malfunction or by the corrective action (e.g., the malfunction was present only a short period of time before detection, replacement parts are functionally representative of the proper mileage, etc.).

(B) Following any unscheduled maintenance approved under paragraph (a)(5)(ii)(A) of this section, the manufacturer shall perform an after-maintenance emissions test. If the Administrator determines that the after-maintenance emission levels for any pollutant indicates that the deterioration factor is no longer representative of production, the Administrator may disqualify the durability-data vehicle.

(iii) Requests for authorization of scheduled maintenance of emission control-related components not specifically authorized to be maintained by these regulations must be made prior to the beginning of durability testing. The Administrator will approve the performance of such maintenance if the manufacturer makes a satisfactory showing that the maintenance will be peformed on vehicles in use.

(6) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the vehicle unrepresentative of vehicles in use, the vehicle shall not be used as a durability-data vehicle.

(7) Where the Administrator agrees under § 86.084–26 to a mileage accumulation of less than 50,000 miles for durability testing, he may modify the requirements of this paragraph.

(8)(i) Adjustment of engine idle speed on emission-data vehicles may be performed once before the 6,436-kilometer (4,000-mile) test point. Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on emission-data vehicles shall be performed only with the advance approval of the Administrator.

(ii)—(iii) [Reserved]

(9) Repairs to vehicle components of the durability-data or emission-data vehicle, other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(10) *For durability-data vehicles:* (i) Complete emission tests (*see* §§ 86.106 through 86.145) are required before and after all approved scheduled maintenance which may reasonably be expected to affect emissions. The Ac ministrator may, however, waive thes test requirements.

(ii)(A) The manufacturers may op tionally perform emission tests befor unscheduled maintenance.

(B) Emission tests are required afte unscheduled maintenance which ma reasonably be expected to affect emis sions.

(C) The Administrator may waiv the requirement to test after unsched uled maintenance.

(iii) These test data may be submi ted weekly to the Administrator, bu shall be air posted or delivered withi 7 days after completion of the tests along with a complete record of a pertinent maintenance, including preliminary engineering report of an malfunction diagnosis and the corre tive action taken.

(iv)(A) A complete engineerin report shall be delivered to the Admin istrator with the manufacturer's appl cation for certification, unless reques ed earlier, in which case it must be de livered within 30 days.

(B) All test data, maintenance re ports, and required engineering re ports shall be compiled and provide to the Administrator in accordanc with § 86.085–23.

(11) The Administrator shall b given the opportunity to verify the ex istence of an overt indication of pa failure and/or vehicle malfunctio (e.g., misfiring, stalling, black smok or an activation of an audible and/o visual signal, prior to the performan of any maintenance to which suc overt indication or signal is relevan under the provisions of this section.

(12) Equipment, instruments, o tools may not be used to identify ma functioning, maladjusted, or defecti engine components unless the same o equivalent equipment, instruments, o tools will be available to dealership and other service outlets and,

(i) Are used in conjunction wi scheduled maintenance on such com ponents,

(ii) Are used subsequent to the iden tification of a vehicle or engine ma function, as provided in paragrap (a)(5)(i) of this section for durabili data vehicles or paragraph (a)(8)(i) this section for emission-data vehicles, or

(iii) Unless specifically authorized by the Administrator.

(b) *Light-duty trucks and heavy-duty engines.* Paragraph (b) of this section applies to light-duty trucks and heavy-duty engines.

(1) Any emission-related maintenance which is performed on vehicles, engines, subsystems, or components used to determine exhaust emission deterioration factors must be technologically necessary for compliance with the standards in actual use. All emission-related *scheduled* maintenance must occur at the same mileage intervals (or equivalent intervals if engines, subsystems, or components are used) that will be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle.

(i) The manufacturer must submit data to the Administrator which demonstrates that all of the emission-related scheduled maintenance which is to be performed on the durability-data vehicles is technologically necessary. EPA has determined that emission-related maintenance at shorter intervals than that outline in paragraphs (b)(1)(ii) and (b)(1)(iii) of this section is not technologically necessary. The Administrator may determine that even maintenance more restrictive (e.g., longer intervals) than that listed in paragraphs (b)(1)(ii) and (b)(1)(iii) of this section is not technologically necessary.

(ii) For gasoline-fueled vehicles or engines, emission-related maintenance in addition to or at shorter intervals than that listed below will not be accepted as technologically necessary, except as provided in paragraph (b)(1)(iv) of this section.

(A)(*1*) The cleaning or replacement of light-duty truck spark plugs at 30,000 miles of use and at 30,000-mile intervals thereafter.

(*2*) The cleaning or replacement of gasoline-fueled heavy-duty engine spark plugs at 12,000 miles (or 360 hours) of use and at 12,000-mile (or 360-hour) intervals thereafter, for engine certified for use with leaded fuel.

(*3*) The cleaning or replacement of gasoline-fueled heavy-duty engine spark plugs at 25,000 miles (or 750 hours) of use and at 25,000-mile intervals (or 750-hour) intervals thereafter, for engines certified for use with unleaded fuel only.

(B) The inspecting, cleaning, adjustment, or replacement of the following at 50,000 miles (or 1,500 hours) of use and at 50,000-mile (or 1,500-hour) intervals thereafter.

(*1*) Positive crankcase ventilation and exhaust gas recirculation valves.

(*2*) Emission-related hoses and tubes.

(*3*) Ignition wires.

(*4*) Oxygen sensor.

(*5*) Idle mixture.

(C) The replacement of the catalytic converter or inspecting and cleaning of the injector tips at 100,000 miles (or 3,000 hours) of use and at 100,000-mile (or 3,000-hour) intervals thereafter.

(D)(*1*) For heavy-duty engines certified for use with leaded fuel, the servicing of the exhaust gas recirculation (EGR) system at 24,000 miles (or 720 hours) of use and at 24,000-mile (or 720-hour) intervals thereafter.

(*2*) For heavy-duty engines certified for use with unleaded fuel only, the servicing of the EGR system at 50,000 miles (or 1,500 hours) of use and at 50,000-mile (or 1,500-hour) intervals thereafter.

(E) Manufacturers may schedule service to the EGR system at the intervals indicated in paragraphs (b)(1)(ii) (B) and (D) of this section, only if an audible and/or visible signal, approved by the Administrator, alerts the engine operator to the need for EGR system maintenance at each of those mileage points.

(iii) For diesel vehicles or engines, emission-related maintenance in addition to or at shorter intervals than that listed below will not be accepted as technologically necessary, except as provided in paragraph (b)(1)(iv) of this section.

(A) The following maintenance at 50,000 miles (or 1,500 hours) of use and at 50,000-mile (or 1,500-hour) intervals thereafter:

(*1*) Cleaning or replacement of the exhaust gas recirculation and positive crankcase ventilation valves;

(*2*) Cleaning of injector tips.

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(B) The cleaning, rebuilding, or replacement of the turbocharger and injectors at 100,000 miles (or 3,000 hours) of use and at 100,000-mile (or 3,000-hour) intervals thereafter for light-duty trucks, or at 150,000 miles (or 4,500 hours) of use and at 150,000-mile (or 4,500-hour) intervals thereafter for heavy-duty engines.

(C) Manufacturers may schedule service to the EGR system at the intervals indicated in paragraph (b)(1)(iii)(A) of this section, only if an audible and/or visible signal, approved by the Administrator, alerts the engine operator to the need for EGR system maintenance at each of those mileage points.

(iv) Requests for authorization of scheduled maintenance of emission control related components in addition to those items of maintenance covered under paragraphs (b)(1)(ii) and (b)(1)(iii) of this section will be considered if the maintenance is a direct result of the implementation of new technology. New technology means any technology not found in production on any motor vehicle prior to the 1980 model year.

(v)(A) Only the maintenance items listed in paragraphs (b)(1)(i) and (b)(1)(ii) of this section are currently considered by EPA to be emission-related maintenance. The Administrator may, however, determine additional maintenance items to be emission-related by announcement in a FEDERAL REGISTER notice. In no event may this notification occur later than September 1 of the calendar year two years prior to the affected model year.

(B) Any manufacturer may request a hearing on the Administrator's determinations in paragraph (b)(1)(v)(A) of this section. The request shall be in writing, signed by an authorized representative of the manufacturer, and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If, after review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078-6 with respect to such issue.

(vi) [Reserved]

(vii) Non-emission related vehicle maintenance which is reasonable and necessary (e.g., oil change, oil filter change, fuel filter change, air filter change, cooling system maintenance, accessory belt inspection, adjustment of idle speed, governor, engine bolt torque, valve lash, injector lash, timing, etc.) may be performed on durability-data vehicles at the intervals recommended by the manufacturer to the ultimate purchaser.

(viii) Unscheduled maintenance may be performed during the testing used to determine deterioration factors, except as provided in paragraph (b)(1)(ix)(A) of this section, only under the following provisions:

(A) An injector or spark plug may be changed if a persistent misfire is detected.

(B) Readjustment of a gasoline-fueled vehicle or engine cold-start enrichment system may be performed if there is a problem of stalling.

(C) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, if the idle speed exceeds the manufacturer's recommended idle speed by 300 rpm or more, or if there is a problem of stalling.

(ix) Any other unscheduled vehicle, engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement during testing to determine deterioration factors shall be performed only with the advance approval of the Administrator.

(A) Such approval will be given if the Administrator:

(*1*) Has made a preliminary determination that the part failure or system malfunction, or the repair of such failure or malfunction, does not render the vehicle or engine unrepresentative of vehicles or engines in use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement; and,

(*2*) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, engine stalling, overheating, fluid leakage, loss of oil pressure, excessive fuel consumption or excessive power loss.

(B) Emission measurement may not be used as a means of determining the need for unscheduled maintenance under paragraph (b)(1)(ix)(A) of this section except under the conditions outlined in paragraph (b)(1)(ix)(B)(*1*) of this section.

(*1*) *Conditions for unscheduled maintenance based upon emission results.* The Administrator may approve unscheduled maintenance on durability-data vehicles or engines based upon a significant change in emission levels that indicates a vehicle or engine malfunction. In these cases the Administrator may first approve specific diagnostic procedures to identify the source of the problem. The Administrator may further approve of specific corrections to the problem after the problem has been identified. The Administrator may only approve the corrective action if the Administrator determined that:

(*i*) The malfunction was caused by nonproduction build practices or by a previously undetected design problem,

(*ii*) The malfunction will not occur in production vehicles or engines in use, *and*

(*iii*) The deterioration factor generated by the durability-data vehicle or engine will remain unaffected by the malfunction or by the corrective action (e.g., the malfunction was present for only a short period of time before detection, replacement parts are functionally representative of the proper mileage or hours, etc.).

(*2*) Following any unscheduled maintenance approved under paragraph (b)(1)(ix)(B)(*1*) of this section, the manufacturer shall perform an after-maintenance emissions test. If the Administrator determines that the after-maintenance emission levels for any pollutant indicates that the deterioration factor is no longer representative of production, the Administrator may disqualify the durability-data vehicle or engine.

(x) [Reserved]

(2) [Reserved]

(3)(i) Scheduled maintenance on emission-data vehicles (or engines) is limited to the adjustment of idle speed once before the low-mileage test point (or the low-hour test point for engines), provided the idle speed is outside the manufacturer's specifications.

(ii)—(iii) [Reserved]

(iv) Any other engine, emission control system, or fuel system, adjustment, repair, removal, disassembly, cleaning, servicing, or replacement shall be performed only with the advance approval of the Administrator.

(4) *Light-duty trucks.* Repairs to vehicle components of the emission-data vehicle other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(5)(i) Complete emission tests (see Subparts B and P of this part) are required, unless waived by the Administrator, before and after catalytic converter or oxygen sensor servicing on any vehicle.

(ii) The Administrator may require emission tests before and after any unscheduled maintenance.

(iii) [Reserved]

(iv) Test data required by paragraph (b)(5) of this section shall be air posted or delivered to the Administrator within 7 working days, along with a complete record of all pertinent maintenance.

(v) When unscheduled maintenance is approved, a preliminary engineering report, unless waived by the Administrator, shall be air posted or delivered within 7 working days. A final engineering report shall be completed and delivered to the Administrator, concurrently with the manufacturer's application for certification.

(vi) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Administrator in accordance with § 86.084–23.

(6) The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or engine malfunction (e.g., misfiring, stalling), or an activation of an audible and/or visual signal, prior to the performance of any maintenance to which such overt indication or signal is relevant under the provisions of this section.

(7) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets and:

(i) Are used in conjunction with scheduled maintenance on such components,

(ii) Are used subsequent to the identification of a vehicle or engine malfunction, as provided in paragraph (b)(3)(iv) of this section for emission-data vehicles, or

(iii) Unless specifically authorized by the Administrator.

[48 FR 52186, Nov. 16, 1983, as amended at 51 FR 24608, July 7, 1986]

§ 86.085–27 Special test procedures.

(a) The Administrator may, on the basis of a written application by a manufacturer, prescribe test procedures, other than those set forth in this part, for any light-duty vehicle, light-duty truck, heavy-duty engine, or gasoline-fueled heavy-duty vehicle which the Administrator determines is not susceptible to satisfactory testing by the procedures set forth in this part.

(b) If the manufacturer does not submit a written application for use of special test procedures but the Administrator determines that a light-duty vehicle, light-duty truck, heavy-duty engine, or gasoline-fueled heavy-duty vehicle is not susceptible to satisfactory testing by the procedures set forth in this part, the Administrator shall notify the manufacturer in writing and set forth the reasons for such rejection in accordance with the provisions of § 86.082–22(c).

[48 FR 1446, Jan. 12, 1983]

§ 86.085–28 Compliance with emission standards.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles.

(2) The applicable exhaust and fuel evaporative emission standards of this subpart apply to the emissions of vehicles for their useful life.

(3) Since it is expected that emission control efficiency will change with mileage accumulation on the vehicle, the emission level of a vehicle which has accumulated 50,000 miles will be used as the basis for determining compliance with the standards.

(4) The procedure for determining compliance of a new motor vehicle with exhaust emission standards is as follows, except where specified by paragraph (a)(5) of this section for the Alternative Durability Program:

(i) Separate emission deterioration factors shall be determined from the exhaust emission results of the durability-data vehicle(s) for each engine-system combination. A separate factor shall be established for exhaust HC, exhaust CO, exhaust NO_x, and exhaust particulate (diesel vehicles only) for each engine-system combination. A separate evaporative emission deterioration factor shall be determined for each evaporative emission family-evaporative emission control system combination from the testing conducted by the manufacturer (gasoline-fueled vehicles only).

(A) The applicable results to be used unless excluded by paragraph (a)(4)(i)(A)(*4*) of this section in determining the exhaust emissiodeterioration factors for each engine-system combination shall be:

(*1*) All valid exhaust emission data from the tests required under § 86.084-26(a)(4) except the zero-mile tests. This shall include the official test results, as determined in § 86.081-29 for all tests conducted on all durability-data vehicles of the combination selected under § 86.084–24(c) (including all vehicles elected to be operated by the manufacturer under § 86.084-24(c)(1)(ii)).

(*2*) All exhaust emission data from the tests conducted before and after the scheduled maintenance provided in § 86.084–25.

(*3*) All exhaust emission data from tests required by maintenance approved under § 86.084–25, in those cases where the Administrator conditioned his approval for the performance of such maintenance on the inclusion of such data in the deterioration factor calculation.

(*4*) The manufacturer has the option of applying an outlier test point procedure to completed durability data within its certification testing program for a given model year. The outlier procedure will be specified by the Administrator. For any pollutant, durability-data test points that are identified as outliers shall not be included in the determination of deterioration factors if the manufacturer has elected this option. The manufacturer shall specify to the Administrator, before the certification of the first engine family for that model year, if it intends to use the outlier procedure. The manufacturer may not change procedures after the first engine family of the model year is certified. Where the manufacturer chooses to apply both the outlier procedure and averaging (as allowed under § 86.082-26(b)(8)(ii)) to the same data set, the outlier procedure shall be completed prior to applying the averaging procedure.

(B) All applicable exhaust emission results shall be plotted as a function of the mileage on the system, rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The data will be acceptable for use in the calculation of the deterioration factor only if the interpolated 4,000-mile and 50,000-mile points on this line are within the low-altitude standards provided in § 86.083-8 or § 86.083-9, as applicable. Exceptions to this where data are still acceptable are when a best fit straight line crosses an applicable standard but no data points exceeded the standard, or the best fit straight lines crosses an applicable standard with a negative slope (the 4,000-mile interpolated point is higher than the 50,000-mile interpolated point) but the 5,000-mile actual data point is below the standard. A multiplicative exhaust emission deterioration factor shall be calculated for each engine-system combination as follows:

Factor = Exhaust emissions interpolated to 50,000 miles divided by exhaust emissions interpolated to 4,000 miles.

These interpolated values shall be carried out to a minimum of four places to the right of the decimal point before dividing one by the other to determine the deterioration factor. The results shall be rounded to three places to the right of the decimal point in accordance with ASTM E 29-67.

(C) An evaporative emissions deterioration factor (gasoline-fueled vehicles only) shall be determined from the testing conducted as described in § 86.084-21(b)(4)(i), for each evaporative emission family-evaporative emission control system combination to indicate the evaporative emission level at 50,000 miles relative to the evaporative emission level at 4,000 miles as follows:

Factor = Evaporative emission level at 50,000 miles minus the evaporative emission level at 4,000 miles.

The factor shall be established to a minimum of two places to the right of the decimal.

(ii)(A) The official exhaust emission test results for each emission-data vehicle at the selected test point shall be multiplied by the appropriate deterioration factor. *Provided*, That if a deterioration factor as computed in paragraph (a)(4)(i)(B) of this section is less than one, that deterioration factor shall be one for the purposes of this paragraph.

(B) The official evaporative emission test results (gasoline-fueled vehicles only) for each evaporative emission-data vehicle at the selected test point shall be adjusted by addition of the appropriate deterioration factor: *Provided:* that if a deterioration factor as computed in paragraph (a)(4)(i)(C) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(iii) The emissions to compare with the standard shall be the adjusted emissions of paragraphs (a)(4)(ii) (A) and (B) of this section for each emission-data vehicle. Before any emission value is compared with the standard, it shall be rounded, in accordance with ASTME 29-67, to two significant figures. The rounded emission values may not exceed the standard.

(iv) Every test vehicle of an engine family must comply with the exhaust emission standards, as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(v) Every test vehicle of an evaporative emission family must comply with the evaporative emission standard, as determined in paragraph (a)(4)(iii) of this section before any vehicle in that family may be certified.

(5) The procedure to determine the compliance of new motor vehicles in the Alternative Durability Program (described in § 86.085-13) is the same as described in paragraphs (a)(4)(iii) through (a)(4)(v) of this section. For the engine families that are included in the Alternative Durability Program, the exhaust emission deterioration factors used to determine compliance shall be those that the Administrator has approved under § 86.085-13(c). The evaporative emission deterioration factor for each evaporative emission family shall be determined and applied according to paragraph (a)(4) of this section. The procedures to determine the minimum exhaust emissions deterioration factors required under § 86.085-13(d) are as follows:

(i) Separate deterioration factors shall be determined from the exhaust emission results of the durability-data vehicles for each engine family group. A separate factor shall be established for exhaust HC, exhaust CO, and exhaust NO_x for each engine family group. The evaporative emission deterioration factor for each evaporative family will be determined and applied in accordance with paragraph (a)(4) of this section.

(ii) The deterioration factors for each engine family group shall be determined by the Administrator using historical durability data from as many as three previous model years. These data will consist of deterioration factors generated by durability-data vehicles representing certified engine families and of deterioration factors from vehicles selected under § 86.085-24(h). The Administrator shall determine how these data will be combined for each engine family group.

(A) The test results to be used in the calculation of each deterioration factor to be combined for each engine family group shall be those test results specified in paragraph (a)(4)(i)(A) of this section.

(B) For each durability-data vehicles selected under § 86.085-24(h), all applicable exhaust emissions results shall be plotted as a function of the mileage on the system rounded to the nearest mile, and the best fit straight line fitted by method of least squares shall be drawn through all these data points. The exhaust deterioration factor for each durability-data vehicles shall be calculated as specified in paragraph (a)(4)(i)(B) of this section.

(C) *Line-crossing.* For the purpose of paragraph (a)(5) of this section, line-crossing occurs when either of the interpolated 4,000- and 50,000-mile points of the best fit straight line exceeds the applicable emission standard and at least one applicable data point exceeds the standard.

(*1*) The Administrator will not accept for certification line-crossing data from preproduction durability-data vehicles selected under § 86.085-24(c)(1), § 86.085-24 (h)(2), or (h)(3).

(*2*) The Administrator will not accept for certification line-crossing data from production durability-data vehicles selected under § 86.085-24(h)(1) unless the 4,000-mile test result multiplied by the engine family group deterioration factor does not exceed the applicable emission standards. The deterioration factors used for this purpose shall be those that were used in the certification of the production vehicle. Manufacturers may calculate this product immediately after the 4,000-mile test of the vehicle. If the product exceeds the applicable standards, the manufacturer may, with the approval of the Administrator, discontinue the vehicle and substitute a new vehicle. The manufacturer may continue the original vehicle, but the data will not be acceptable if line-crossing occurs.

(b)(1) Paragraph (b) of this section applies to light-duty trucks.

(2) The exhaust and fuel evaporative emission standards of § 86.085-9 apply to the emissions of vehicles for their useful life.

(3) Since emission control efficiency generally decreases with the accumulation of mileage on the vehicle, deterioration factors will be used in combination with emission-data vehicle test results as the basis for determining compliance with the standards.

(4)(i) Paragraph (b)(4) of this se tion describes the procedure for de mining compliance of a new vehicle with exhaust emission standards, based on deterioration factors supplied by the manufacturers, except where specified by paragraph (b)(5) of this section for the Alternative Durability Program.

(ii) Separate exhaust emission deterioration factors, determined from test of vehicles, engines, subsystems, or components conducted by the manufacturer, shall be supplied for each engine-system combination. Separate factors shall be established for transient HC, CO, and NO_x, idle CO (gasoline vehicles only), and exhaust particulate (diesel vehicles only).

(iii) For transient HC, CO, and NO_x, idle CO (gasoline vehicles only), and exhaust particulate (diesel vehicles only), the official exhaust emission results for each emission-data vehicle at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(iv) The emission values to compare with the standards (or family emission limits, as appropriate) shall be the adjusted emission values of paragraph (b)(4)(iii) of this section, rounded to the same number of significant figures as contained in the applicable standard in accordance with ASTM E 29–67, for each emission-data engine.

(5) The procedure to determine the compliance of new motor vehicles in the Alternative Durability Program (described in § 86.085–13) is the same as described in paragraphs (b)(4)(iv), (b)(6)(iv) and (b)(7) of this section. For the engine families that are included in the Alternative Durability Program, the exhaust emission deterioration factors used to determine compliance shall be those that the Administrator has approved under § 86.085–13(c). The evaporative emission deterioration factor for each evaporative emission family shall be determined and applied according to paragraph (b)(6) of this section. The procedures to determine the minimum exhaust emissions deterioration factors required under § 86.085–13(d) are as follows:

(i) Separate deterioration factors shall be determined from the exhaust emission results of the durability-data vehicles for each engine family group. A separate factor shall be established for exhaust HC, exhaust CO, and exhaust NO_x for each engine family group. The evaporative emission deterioration factor for each evaporative family will be determined and applied in accordance with paragraph (b)(6) of this section.

(ii) The deterioration factors for each engine family group shall be determined by the Administrator using historical durability data from as many as three previous model years. These data will consist of deterioration factors generated by durability data vehicles representing certified engine families and of deterioration factors from vehicles selected under § 86.085–24(h). The Administrator shall determine how these data will be combined for each engine family group.

(A) The test results to be used in the calculations of each deterioration factor to be combined for each engine family group shall be those test results specified in paragraph (a)(4)(i)(A) of this section.

(B) For each durability data vehicle selected under § 86.085–24(h), all applicable exhaust emission results shall be plotted as a function of the mileage on the system rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The exhaust deterioration factor for each durability data vehicle shall be calculated as specified in paragraph (a)(4)(i)(B) of this section.

(C) *Line crossing.* For the purposes of paragraph (b)(5) of this section, line crossing occurs when either of the interpolated, 4,000- and 50,000-mile points of the best fit straight line exceeds the applicable emission standard and at least one applicable data point exceeds the standard.

(*1*) The Administrator will not accept for certification line-crossing data from preproduction durability data vehicles selected under § 86.085–24(c)(1), § 86.085–24 (h)(2), or (h)(3).

(*2*) The Administrator will not accept for certification line-crossing data from production durability data vehicles selected under § 86.085-24(h)(1) unless the 4,000-mile test result multiplied by the engine family group deterioration factor does not exceed the applicable emission standard. The deterioration factors used for this purpose shall be those that were used in the certification of the production vehicle. Manufacturers may calculate this product immediately after the 4,000-mile test of the vehicle. If the product exceeds the applicable standard, the manufacturer may, with the approval of the Administrator, discontinue the vehicle and substitute a new vehicle, but the data will not be acceptable if line crossing occurs.

(6)(i) Paragraph (b)(6) of this section describes the procedure for determining compliance of a new vehicle with fuel evaporative emission standards. The procedure described here shall be used for all vehicles in all model years.

(ii) The manufacturer shall determine, based on testing described in § 86.084-21(b)(4)(i), and supply an evaporative emission deterioration factor for each evaporative emission family-evaporative emission control system combination. The factor shall be calculated by subtracting the emission level at the selected test point from the emission level at the useful life point.

(iii) The official evaporative emission test results for each evaporative emission-data vehicle at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission value to compare with the standards shall be the adjusted emission value of paragraph (b)(6)(iii) of this section rounded to two significant figures in accordance with ASTM E 29-67 for each evaporative emission-data vehicle.

(7) Every test vehicle of an engine family must comply with all applicable standards, as determined in paragraph (b)(4)(iv) or (b)(5)(iv) and paragraph (b)(6) of this section, before any vehicle in that family will be certified.

(c)(1) Paragraph (c) of this sectio
applies to heavy-duty engines.

(2) The exhaust emission standar
for gasoline-fueled engines in § 86.08
10 or for diesel engines in § 86.085-
apply to the emissions of engines
their useful life.

(3) Since emission control efficien
generally decreases with the accum-
lation of service on the engine, de
rioration factors will be used in com
nation with emission-data engine te
results as the basis for determin
compliance with the standards.

(4)(i) Paragraph (c)(4) of this secti
describes the procedure for deter
ing compliance of an engine with em
sion standards, based on deteriorat
factors supplied by the manufactur

(ii) Separate exhaust emissio de
rioration factors, determined
tests of engines, subsystems, or comp
nents conducted by the manufactur
shall be supplied for each engi
system combination. For gasoline a
diesel engines, separate factors sh
be established for transient HC, C
and NO_x. For diesel smoke testing, se
arate factors shall also be establis
for the acceleration mode (designa
as "A"), the lugging mode (designa
as "B"), and peak opacity (designa
as "C").

(iii)(A) Paragraph (c)(4)(iii)(A)
this section applies to gasoline-fue
heavy-duty engines.

(*1*) *Gasoline-fueled heavy-duty*
gines not utilizing aftertreatment te
nology (e.g. catalytic converters).
transient HC, CO, and NO_x, the o
cial exhaust emission results for e
emission-data engine at the selec
test point shall be adjusted by the
dition of the appropriate deteriora
factor. However, if the deteriorat
factor supplied by the manufacture
less than zero, it shall be zero for t
purposes of this paragraph.

(*2*) *Gasoline-fueled heavy-duty*
gines utilizing aftertreatment tech
ogy (e.g. catalytic converters).
transient HC, CO, and NO_x, the o
cial exhaust emission results for e
emission-data engine at the selec
test point shall be adjusted by m
plication by the appropriate deter
tion factor. However, if the deteri
tion factor supplied by the manu

turer is less than one, it shall be one for the purposes of this paragraph.

(B) Paragraph (c)(4)(iii)(B) of this section applies to diesel heavy-duty engines.

(*1*) *Diesel heavy-duty engines not utilizing aftertreatment technology (e.g. particulate traps).* For transient HC, CO, and NO_x, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(*2*) *Diesel heavy-duty engines not utilizing aftertreatment technology (e.g. particulate traps).* For transient HC, CO, and NO_x, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(*3*) For acceleration smoke (“A”), lugging smoke (“B”), and peak smoke (“C”), the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission values to compare with the standards (or family emission limits, as appropriate) shall be the adjusted emission values of paragraph (c)(4)(iii) of this section, rounded to the same number of significant figures as contained in the applicable standard in accordance with ASTM E 29-67, for each emission-data engine.

(5)–(6) [Reserved]

(7) Every test engine of an engine family must comply with all applicable standards, as determined in paragraph (c)(4)(iv) of this section, before any engine in that family will be certified.

(d)(1) Paragraph (d) of this section applies to gasoline-fueled heavy-duty vehicles.

(2) The applicable fuel evaporative emission standard in § 86.085-10 applies to the emissions of vehicles for their useful life.

(3)(i) For vehicles with a GVWR of up to 26,000 pounds because it is expected that emission control efficiency will change during the useful life of the vehicle, an evaporative emission deterioration factor shall be determined from the testing described in § 86.085-23(b)(3) for each evaporative emission family-evaporative emission control system combination to indicate the evaporative emission control system deterioration during the useful life of the vehicle (minimum 50,000 miles). The factor shall be established to a minimum of two places to the right of the decimal.

(ii) For vehicles with a GVWR of greater than 26,000 pounds; because it is expected that emission control efficiency will change during the useful life of the vehicle, each manufacturer's statement as required in § 86.085-23(b)(4)(ii) shall include, in accordance with good engineering practice, consideration of control system deterioration.

(4) The evaporative emission tests results, if any, shall be adjusted by the addition of the appropriate deterioration factor: *Provided*, That if the deterioration factor as computed in paragraph (d)(3) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(5) The emission level to compare with the standard shall be the adjusted emission level of paragraph (d)(4) of this section. Before any emission value is compared with the standard, it shall be rounded, in accordance with ASTM E 29-67, to two significant figures. The rounded emission values may not exceed the standard.

(6) Every test vehicle of an evaporative emission family must comply with the evaporative emission standard, as determined in paragraph (d)(5) of this section, before any vehicle in that family may be certified.

(Approved by the Office of Management and Budget under control number 2000-0390)

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§ 86.085-29 Testing by the Administrator.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(2) The Administrator may require that any one or more of the test vehicles be submitted to him, at such place or places as he may designate, for the purposes of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test vehicle, the results of that test shall, unless subsequently invalidated by the Administrator, comprise the official data for the vehicle at the prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on a test vehicle at a test point, the manufacturer's test data will be accepted as the official data for that point: *Provided,* That if the Administrator makes a determination based on testing under paragraph (a)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *And further provided,* That if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provisions of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission or further information. If the manufacturer conducts more than one test on a vehicle, as authorized under § 86.084-26 (a)(3)(i)(A) or (b)(4)(i)(A), the data from the last test in that series of tests on that vehicle, will constitute the official data.

(iii)(A)(*1*) The Administrator may adjust or cause to be adjusted any adjustable parameter of an emission data vehicle or engine which the Administrator has determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.085-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.085-22(e)(3)(i), prior to the performance of any tests to determine whether such vehicle or engine conforms to applicable emission standards, including tests performed by the manufacturer under § 86.085-23(c)(1). The Administrator, in making or specifying such adjustments, will consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use light-duty vehicles or light-duty trucks. In determining likelihood, the Administrator will consider factors such as, but not limited to, the effect of the adjustment on vehicle performance characteristics and surveillance information from similar in-use vehicles.

(*2*) For those vehicles or engine parameters which the Administrator has not determined to be subject to adjustment during certification and Selective Enforcement Audit testing in accordance with § 86.084-22(e)(1), the emission-data vehicle presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the vehicle label (see § 86.084-35(a)(1)(iii)(D) or (a)(2)(iii)(D)) as specified in the application for certification. If the Administrator determines that a vehicle is not within such tolerances, the vehicle will be adjusted, at the facility designated by the Administrator, prior to

e test and an engineering report
all be submitted to the Administra-
r describing the corrective action
ken. Based on the engineering
port, the Administrator will deter-
ne if the vehicle will be used as an
ission-data vehicle.

B) If the Administrator determines
at the test data developed on an
ission-data vehicle under paragraph
(3)(i) of this section would cause
at vehicle to fail due to excessive
00 mile emissions or by application
the appropriate deterioration
tor, then the following procedure
all be observed:

1) The manufacturer may request a
est. Before the retest, those vehicle
engine parameters which the Ad-
istrator has not determined to be
ject to adjustment for certification
l Selective Enforcement Audit test-
in accordance with § 86.085-
e)(1) may be readjusted to manu-
turer's specification, if those ad-
tments were made incorrectly prior
the first test. The Administrator
y adjust or cause to be adjusted any
ameter which the Administrator
determined to be subject to adjust-
nt to any setting within the phys-
ly adjustable range of that parame-
as determined by the Administra-
in accordance with § 86.085-
e)(3)(i). Other maintenance or re-
s may be performed in accordance
n § 86.085–25. All work on the vehi-
shall be done at such location and
er such conditions as the Adminis-
or may prescribe.

) The vehicle will be retested by
Administrator and the results of
test shall comprise the official
for the emission-data vehicle.

) If sufficient durability data are
available at the time of any emis-
test conducted under paragraph
2) of this section to enable the Ad-
istrator to determine whether an
sion-data vehicle would fail, the
ufacturer may request a retest in
rdance with the provisions of
graphs (a)(3)(iii) (A) and (B) of
section. If the manufacturer does
promptly make such request, he
l be deemed to have waived the
t to a retest. A request for retest
t be made before the manufactur-

er removes the vehicle from the test premises.

(b)(1) Paragraph (b) of this section applies to heavy-duty engines.

(2) The Administrator may require that any one or more of the test engines be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test engine the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the engine at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on a test engine at a test point, the manufacturer's test data will be accepted as the official data for that test point: *Provided*, That if the Administrator makes a determination based on testing under paragraph (b)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer: *And further provided*, That if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission of further information.

(iii)(A)(*1*) The Administrator may adjust or cause to be adjusted any adjustable parameter of an emission-data

best copy available

engine which the Administrator has determined to be subject to adjustment for certification testing in accordance with § 86.085-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.085-22(e)(3)(i), prior to the performance of any tests to determine whether such engine conforms to applicable emission standards, including tests performed by the manufacturer under § 86.085-23(c)(2). The Administrator, in making or specifying such adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use heavy-duty engines. In determining likelihood, the Administrator may consider factors such as, but not limited to, the effect of the adjustment on engine performance characteristics and surveillance information from similar in-use engines.

(*2*) For those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.085-22(e)(1), the emission-data engine presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the engine label (see § 86.085-35(a)(3)(iii)) as specified in the application for certification. If the Administrator determines that an engine is not within such tolerances, the engine shall be adjusted at the facility designated by the Administrator prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the engine shall be used as an emission-data engine.

(B) If the Administrator determines that the test data developed under paragraph (b)(3)(iii)(A) of this section would cause the emission-data engine to fail due to excessive 125-hour emission values or by the application of the appropriate deterioration factor, then the following procedure shall be observed:

(*1*) The manufacturer may request a retest. Before the retest, those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.085-22(e)(1) may be readjusted to the manufacturer's specifications, if these adjustments were made incorrectly prior to the first test. The Administrator may adjust or cause to be adjusted any parameter which the Administrator has determined to be subject to adjustment in accordance with § 86.085-22(e)(3)(i). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before it accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. Other maintenance or repairs may be performed in accordance with § 86.085-25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The engine will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data engine.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (b)(2) of thid section to enable the Administrator to determine whether an emission-data engine would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (b)(3)(iii)(B) (*1*) and (*2*) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the engine from the test premises.

(c)(1) Paragraph (c) of this section applies to gasoline-fueled heavy-duty vehicles.

(2) The Administrator may require that any one or more of the evaporative emission family-system combinations included in the manufacturer's

tement(s) of compliance be in- lled on an appropriate vehicle and h vehicle be submitted to him, at h place or places as he may desig- e, for the purpose of conducting issions tests. The Administrator y specify that he will conduct such ing at the manufacturer's facility, which case instrumentation and ipment specified by the Adminis- or shall be made available by the nufacturer for test operations. Any ing conducted at a manufacturer's lity pursuant to this paragraph ll be scheduled by the manufactur- s promptly as possible.

)(i) Whenever the Administrator ducts a test on an evaporative ssion family-system combination results of that test, unless subse- ntly invalidated by the Administra- shall comprise the official data for evaporative emission family- em combination and the manufac- r's data, analyses, etc. shall not be l in determining compliance with ssion standards.

) Whenever the Administrator s not conduct a test on an evapora- emission family-system combina- , the manufacturer's test data will ccepted as the official data: *Pro- d*, That if the Administrator es a determination based on test- under paragraph (c)(2) of this sec- , that there is a lack of correlation veen the manufacturer's test pment and the test equipment l by the Administrator, no manu- rer's test data will be accepted purposes of certification until the ons for the lack of correlation are rmined and the validity of the is established by the manufactur- *nd further provided*, That if the inistrator has reasonable basis to ve that any test data, analyses, or r information submitted by the ufacturer is not accurate or has obtained in violation of any pro- n of this part, the Administrator refuse to accept that data, analy- tc. as the official data pending re- ng or submission of further infor- on.

oved by the Office of Management Budget under control number 2000-

[48 FR 1447, Jan. 12, 1983, as amended at 48 FR 52190, Nov. 16, 1983; 49 FR 3019, Jan. 24, 1984; 50 FR 4514, Jan. 31, 1985]

§ 86.085-30 Certification.

(a)(1)(i) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 86.078-7(c), and any other pertinent data or information, the Administrator determines that a test vehicle(s) (or test engine(s)) meet(s) the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such vehicle(s) (or engine(s)) except in cases covered by paragraphs (a)(1)(ii) and (c) of this section.

(ii) *Gasoline-fueled heavy-duty vehicles*. If, after a review of the statement(s) of compliance submitted by the manufacturer under § 86.085-23(b)(4) and any other pertinent data or information, the Administrator determines that the requirements of the Act and this subpart have been met, he will issue one certificate of conformity per manufacturer with respect to the evaporative emission family(s) covered by such statement(s) except in cases covered by paragraph (c) of this section.

(2) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary or appropriate to assure that any new motor vehicle (or new motor vehicle engine) covered by the certificate will meet the requirements of the Act and of this part.

(3)(i) One such certificate will be issued for each engine family. For gasoline-fueled light-duty vehicles and light-duty trucks, one such certificate will be issued for each engine family-evaporative emission family combination.

(A) *Light-duty vehicles*. Each certificate will certify compliance with no more than one set of standards.

(B) *Light-duty trucks*. Each certificate will certify compliance with no more than one set of standards except for low-altitude standards and high-altitude standards. The certificate shall state that it covers vehicles sold or delivered to an ultimate purchaser for principal use at a designated high-altitude location only if the vehicle conforms in all material respects to the design specifications that apply to those vehicles described in the application for certification at high altitude.

(ii) For gasoline-fueled heavy-duty vehicles, one such certificate will be issued for each manufacturer and will certify compliance for those vehicles previously identified in that manufacturer's statement(s) of compliance as required in § 86.085-23(b)(4)(i) and (ii).

(4)(i) The adjustment or modification of any light-duty truck in accordance with instructions provided by the manufacturer for the altitude where the vehicle is principally used will not be considered a violation of section 203(a)(3) of the Clean Air Act.

(ii) A violation of section 203(a)(1) of the Clean Air Act occurs when a manufacturer sells or delivers to an ultimate purchaser any light-duty vehicle or light-duty truck, subject to the regulations under the Act, under any of the conditions specified in the remainder of this paragraph.

(A) When a light-duty vehicle or light-duty truck is not configured to meet high-altitude requirements:

(*1*) At a designated high-altitude location, unless such manufacturer has reason to believe that such vehicle will not be sold to an ultimate purchaser for principal use at a designated high-altitude location; or

(*2*) At a location other than a designated high-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated high-altitude location.

(B) When a light-duty vehicle is not configured to meet low-altitude requirements, as provided in § 86.085-8(i):

(*1*) At a designated low-altitude location, unless such manufacturer has reason to believe that such vehicle will not be sold to an ultimate purchaser for principal use at a designated low-altitude location; or

(*2*) At a location other than a designated low-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated low-altitude location.

(iii) A manufacturer shall be deemed to have reason to believe that a light-duty vehicle that has been exempted from compliance with emission standards at high-altitude, or a light-duty truck which is not configured to meet high-altitude requirements, will not be sold to an ultimate purchaser for principal use at a designated high-altitude location if the manufacturer has informed its dealers and field representatives about the terms of these high-altitude regulations, has not caused the improper sale itself, and has taken reasonable action which shall include, but not be limited to, either paragraph (a)(4)(iii) (A) or (B), and (C) of this section.

(A) Requiring dealers in designated high-altitude locations to submit written statements to the manufacturer signed by the ultimate purchaser that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location; requiring dealers in counties contiguous to designated high-altitude locations to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location; and for each sale or delivery of fleets of ten or more such vehicles in a high-altitude location or in counties contiguous to high-altitude locations, requiring either the selling dealer or the delivering dealer to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location. In addition, the manufacturer will make available to EPA, upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold), sales, warranty, or other information pertaining to sales of vehicles by the dealers described above maintained by the manufacturer in the normal course of business relating to the altitude configuration of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of low-altitude vehicles by high-altitude dealers, or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser for principal use at a designated high-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a State or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser residing in a designated high-altitude location, or based on information obtained pursuant to paragraph (a)(4)(iii) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and, where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet high-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(iv) A manufacturer shall be deemed to have reason to believe that a light-duty vehicle which has been exempted from compliance with emission standards to low-altitude, as provided in § 86.084-8(i), will not be sold to an ultimate purchaser for principal use at a designated low-altitude location if the manufacturer has informed its dealers and field representatives about the terms of these high-altitude regulations, has not caused the improper sale itself, and has taken reasonable action which shall include, but not be limited to, either paragraph (a)(4)(iv) (A) or (B), and (C) of this section.

(A) Requiring dealers in designated low-altitude locations to submit written statements to the manufacturer signed by the ultimate purchaser that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated low-altitude location; requiring dealers in counties contiguous to designated low-altitude locations to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated low-altitude location, that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated low-altitude location; and for each sale or delivery of fleets of ten or more such vehicles in a low-altitude location or in counties contiguous to low-altitude locations, requiring either the selling dealer or the delivering dealer to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated low-altitude location, that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated low-altitude location. In addition, the manufacturer will make available to EPA, upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold), sales, warranty, or other information pertaining to sales of vehicles by the dealers described above maintained by the manufacturer in the normal course of business relating to the altitude configuration of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of high-altitude vehicles by low-altitude dealers, or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the low-altitude requirements to an ultimate purchaser for principal use at a designated low-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a State or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the low-altitude requirements to an ultimate purchaser residing in a designated low-altitude location, or based on information obtained pursuant to paragraph (a)(4)(iv) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and, where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet low-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(5)(i) For the purpose of paragraph (a) of this section, a "designated high-altitude location" is any county which has substantially all of its area located above 1,219 meters (4,000 feet) and:

(A) Requested an extension past the attainment date of December 31, 1982, for compliance with either the National Ambient Air Quality Standards for carbon monoxide or ozone, as indicated in Part 52 (Approval and Promulgation of Implemention Plans) of this title; or

(B) Is in the same state as a county designated as a high-altitude location according to paragraph (a)(5)(i)(A) of this section.

(ii) The designated high-altitude locations defined in paragraph (a)(5)(i) of this section are listed below:

STATE OF COLORADO

Adams
Alamosa
Arapahoe
Archuleta
Boulder
Chaffee
Cheyenne
Clear Creek
Conejos
Costilla
Crowley
Custer
Delta
Denver
Dolores
Douglas
Eagle
Elbert
El Paso
Fremont
Garfield
Gilpin
Grand
Gunnison
Hinsdale
Huerfano
Jackson
Jefferson
Kit Carson
Lake
La Plata
Larimer
Las Animas
Lincoln
Mesa
Mineral
Moffat
Montezuma
Montrose
Morgan
Otero
Ouray
Park
Pitkin
Pueblo
Rio Blanco
Rio Grande
Routt
Saguache
San Juan
San Miguel
Summit
Teller
Washington
Weld

STATE OF NEVADA

Carson City
Douglas
Elko
Esmeralda
Eureka
Humboldt
Lander
Lincoln
Lyon
Mineral
Nye
Pershing
Storey
Washoe
White Pine

STATE OF NEW MEXICO

Bernalillo
Catron
Colfax
Curry
De Baca
Grant
Guadalupe
Harding
Hidalgo
Lincoln
Los Alamos
Luna
McKinley
Otero
Mora
Rio Arriba
Roosevelt
Sandoval
San Juan
San Miguel
Santa Fe
Sierra
Socorro
Taos
Torrance
Union
Valencia

STATE OF UTAH

Beaver
Box Elder
Cache
Carbon
Daggett
Davis
Duchesne
Emery
Garfield
Grand
Iron
Juab
Kane
Millard
Morgan
Piute
Rich
Salt Lake
San Juan
Sanpete
Sevier
Summit

Tooele
Uintah
Utah
Wasatch
Wayne
Weber

(iii) For the purpose of paragraph (a) of this section, a "designated low-altitude location" is any county which has substantially all of its area located below 1,219 meters (4,000 feet).

(iv) The designated low-altitude locations so defined include all counties in the United States which are not listed in either paragraph (a)(5)(ii) of this section or in the list below:

STATE OF ARIZONA

Apache
Cochise
Coconino
Navajo
Yavapai

STATE OF IDAHO

Bannock
Bear Lake
Bingham
Blaine
Bonneville
Butte
Camas
Caribou
Cassia
Clark
Custer
Franklin
Fremont
Jefferson
Lemhi
Madison
Minidoka
Oneida
Power
Teton
Valley

STATE OF MONTANA

Beaverhead
Deer Lodge
Gallatin
efferson
udith Basin
Madison
Meagher
Park
Powell
Silver Bow
Wheatland

STATE OF NEBRASKA

Banner
Cheyenne
Kimball
Sioux

STATE OF OREGON

Harney
Klamath
Lake

STATE OF TEXAS

eff Davis
udspeth
Parmer

STATE OF WYOMING

lbany
ampbell
arbon
onverse
remont
oshen
ot Springs
hnson
aramie
ncoln
Natrona
Niobrara
Park
Platte
Sublette
Sweetwater
Teton
Uinta
Washakie
Weston

(6) [Reserved]

(7) Catalyst-equipped vehicles, otherwise covered by a certificate, which are driven outside the United States, Canada, and Mexico will be presumed to have been operated on leaded gasoline resulting in deactivation of the catalysts. If these vehicles are imported or offered for importation without retrofit of the catalyst, they will be considered not to be within the coverage of the certificate unless included in a catalyst control program operated by a manufacturer or a United States Government agency and approved by the Administrator.

(8) For incomplete light-duty trucks, a certificate covers only those new motor vehicles which, when completed by having the primary load-carrying device or container attached, conform to the maximum curb weight and frontal area limitations described in the application for certification as required in § 86.084-21(d).

(9) For heavy-duty engines, a certificate covers only those new motor vehicle engines installed in heavy-duty vehicles which conform to the minimum gross vehicle weight rating, curb weight, or frontal area limitations for heavy-duty vehicles described in § 86.082-2.

(10) For incomplete gasoline-fueled heavy-duty vehicles, a certificate covers only those new motor vehicles which, when completed, conform to the nominal maximum fuel tank capacity limitations as described in the application for certification as required in § 86.085-21(e).

(b)(1) The Administrator will determine whether a vehicle (or engine) covered by the application complies with applicable standards by observing the following relationships:

(i) *Light-duty vehicles.* (A) The durability-data vehicle(s) selected under § 86.085-24(c)(1)(i) shall represent all vehicles of the same engine-system combination.

(B) The emission-data vehicle(s) selected under § 86.085-24 (b)(1)(ii) through (b)(1)(iv) shall represent all vehicles of the same engine-system combination, as applicable.

(C) The emission-data vehicle(s) selected under § 86.085-24 (b)(1)(vii)(A) and (b)(1)(vii)(B) shall represent all vehicles of the same evaporative control system within the evaporative family.

(ii) *Light-duty trucks.*

(A) [Reserved]

(B) The emission-data vehicle(s) selected under § 86.085-24(b)(1)(ii) shall represent all vehicles of the same engine-system combination, as applicable.

(C) The emission-data vehicle(s) selected under § 86.085-24 (b)(1)(vii)(A) and (b)(1)(vii)(B) shall represent all vehicles of the same evaporative control system within the evaporative family.

(D) The emission-data vehicle(s) selected under § 86.085-24(b)(1)(v) shall represent all vehicles of the same engine-system combination, as applicable.

(E) The emission-data vehicle(s) selected under § 86.085-24(b)(1)(viii) shall represent all vehicles of the same evaporative control system within the evaporative emission family, as applicable.

(iii) *Heavy-duty engines.* (A) A gasoline-fueled emission test engine selected under § 86.085-24(b)(2)(iv) shall represent all engines in the same family of the same engine displacement-exhaust emission control system combination.

(B) A gasoline-fueled emission test engine selected under § 86.085-24(b)(2)(iii) shall represent all engines in the same family of the same engine displacement-exhaust emission control system combination.

(C) A diesel emission-data test engine selected under § 86.085-24(b)(3)(ii) shall represent all engines in the same engine-system combination.

(D) A diesel emission-data test engine selected under § 86.085-24(b)(3)(iii) shall represent all engines of that emission control system at the rated fuel delivery of the test engine.

(E) [Reserved]

(iv) *Gasoline-fueled heavy-duty vehicles.* A statement of compliance submitted under § 86.085-23(b)(4)(i) or § 86.085-23(b)(4)(ii) shall represent all vehicles in the same evaporative emission family-evaporative emission control system combination.

(2) The administrator will proceed as in paragraph (a) of this section with respect to the vehicles (or engines) belonging to an engine family or engine family-evaporative emission family combination (as applicable), all of which comply with all applicable standards.

(3) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to § 86.085-29, data or information derived from any inspection carried out under § 86.078-7(c) or any other pertinent data or information, the Administrator determines that one or more test vehicles (or test engines) of the certification test fleet do not meet applicable standards, he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determination and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078-6 with respect to such issue.

(4) For light-duty vehicles and light-duty trucks the manufacturer may, at its option, proceed with any of the following alternatives with respect to an emission-data vehicle determined not in compliance with all applicable standards for which it was tested:

(i) Request a hearing under § 86.078-6; or

(ii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed, from his application;

(A) If the failed vehicle was tested for compliance with exhaust emission standards only: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission data vehicle to be tested for exhaust emission compliance only.

(B) If the failed vehicle was tested for compliance with both exhaust and evaporative emission standards: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle which will be tested for compliance with both exhaust and evaporative emission standards. If one vehicle cannot be selected in accordance with the selection criteria employed in selecting the failed vehicle, then two vehicles may be selected (i.e., one vehicle to satisfy the exhaust emission vehicle selection criteria and one vehicle to satisfy the evaporative emission vehicle selection criteria). The vehicle selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards only. The vehicle selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards; or

(iii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed from the application and add a vehicle configuration(s) (or evaporative vehicle configuration(s), as applicable) not previously listed. The Administrator may require, if applicable, that the failed vehicle be modified to the new engine code (or evaporative emission code, as applicable) and demonstrate by testing that it meets applicable standards for which it was originally tested. In addition, the Administrator may select, in accordance with the vehicle selection criteria given in § 86.085-24(b), a new emission-data vehicle or vehicles. The vehicles selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards only. The vehicles selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards; or

(iv) Correct a component or system malfunction and show that with a correctly functioning system or component the failed vehicle meets applicable standards for which it was originally tested. The Administrator may require a new emission-data vehicle, of identical vehicle configuration (or evaporative vehicle configuration, as applicable) to the failed vehicle, to be operated and tested for compliance with the applicable standards for which the failed vehicle was originally tested.

(5) For heavy-duty engines the manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test engine(s) determined not in compliance with applicable standards:

(i) Request a hearing under § 86.078-6; or

(ii) Delete from the application for certification the engines represented by the failing test engine. (Engines so deleted may be included in a later request for certification under § 86.079-32.) The Administrator may then select in place of each failing engine an alternate engine chosen in accordance with selecting criteria employed in selection the engine that failed; or

(iii) Modify the test engine and demonstrate by testing that it meets applicable standards. Another engine which is in all material respects the same as the first engine, as modified, may then be operated and tested in accordance with applicable test procedures.

(6) If the manufacturer does not request a hearing or present the required data under paragraph (b)(4) or (b)(5) (as applicable) of this section, the Administrator will deny certification.

(c)(1) Notwithstanding the fact that any certification vehicle(s) (or certification engine(s)) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such vehicle(s) (or engine(s)) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof;

(ii) The manufacturer renders inaccurate any test data which he submits pertaining thereto or otherwise circumvents the intent of the Act, or of this part with respect to such vehicle (or engine);

(iii) Any EPA Enforcement Officer is denied access on the terms specified in § 86.078-7(c) to any facility or portion thereof which contains any of the following:

(A) The vehicle (or engine);

(B) Any components used or considered for use in its modification or buildup into a certification vehicle (or certification engine);

(C) Any production vehicle (or production engine) which is or will be claimed by the manufacturer to be covered by the certificate;

(D) Any step in the construction of a vehicle (or engine) described in paragraph (c)(1)(iii)(C) of this section;

(E) Any records, documents, reports, or histories required by this part to be kept concerning any of the above;

(iv) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 86.078-7(c)) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(2) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraph (c)(1)(i), (ii), (iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void ab initio.

(4) In any case in which certification of a vehicle (or engine) is proposed to be withheld, denied, revoked, or suspended under paragraph (c)(1) (iii) or (iv) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.078-7(c) in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle (or engine) in question was not involved in the violation to a degree that would warrant withholding denial, revocation, or suspension of certification under either paragraph (c)(1) (iii) or (iv) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(5) Any revocation or suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.078-6 hereof.

(ii) Extend no further than to forbid the introduction into commerce of vehicles (or engines) previously covered by the certification which are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes the certification invalid ab initio.

(6) The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Administrator under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with § 86.078-6. If the Administrator finds, after a review of the request and supporting data, that the request raises a substantial factual issue, he will grant the request with respect to such issue.

(d)(1) *For light-duty vehicles.* Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.603; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.603; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursu ant to the requirements of § 86.609; o

(iv) The manufacturer renders inac curate any test data which he submit pursuant to § 86.609; or

(v) Any EPA Enforcement Officer denied access to a facility on the ter specified in § 86.606; or

vi) Any EPA Enforcement Officer is
nied the opportunity on the terms
ecified in § 86.606, to:

(A) Monitor vehicle selection pursu-
nt to § 86.607, or

(B) Select vehicles for testing pursu-
nt to § 86.607, or

(C) Monitor vehicle testing per-
ormed to satisfy any of the require-
nents of this part; or

(vii) Any EPA Enforcement Officer
s denied "reasonable assistance" as
lefined in § 86.606 in examining any of
the items listed in that section; or

(viii) The manufacturer refuses to comply with the requirements of §§ 86.604(a), 86.605, and 86.607, 86.608, 86.610, or § 86.611.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraph (d)(1) (i), (ii), or (viii) of this section where such refusal is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but not be limited to, any uncontrollable factors which results in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturer to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanctions of suspending a certificate may be imposed for the reasons in paragraph (d)(1) (iii), (iv), (v), (vi), or (vii) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a vehicle is proposed to be suspended under paragraph (d)(1) (v), (vi), or (vii) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.606 in fact occurred, the manufacturer, if he wishes to contend that even though the violation occurred, the vehicle configuration or engine family in question was not involved in the violation to the degree that would warrant suspension of certification under either paragraph (d)(1) (v), (vi), or (vii) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (d)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.613 hereof, and

(ii) Not apply to vehicles no longer in the hands of the manufacturer.

(e) *For light-duty trucks and heavy-duty engines.* (1) Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle or engine configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.1003; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.1003; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.1009; or

(iv) The manufacturer renders inaccurate any test data submitted pursuant to § 86.1009; or

(v) Any EPA Enforcement Officer is denied the opportunity to conduct activities related to entry and access as authorized in § 86.1006 of this part and in a warrant or court order presented to the manufacturer or the party in charge of a facility in question; or

(vi) EPA Enforcement Officers are unable to conduct activities related to entry and access as authorized in § 86.1006 of this part because a manufacturer has located a facility in a foreign jurisdiction where local law prohibits those activities; or

(vii) The manufacturer refuses to or in fact does not comply with the requirements of § 86.1004(a), § 86.1005, § 86.1007, § 86.1008, § 86.1010, § 86.1011, or § 86.1013.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraph (e)(1) (i), (ii), or (vii) of this section where such refusal or denial is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but are not limited to, any uncontrollable factors which result in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturers to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanction of suspending a certificate may be imposed for the reasons outlined in paragraph (e)(1), (iii), (iv), or (v) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a light-duty truck or heavy-duty engine is proposed to be suspended under paragraph (e)(1)(v) of this section and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.1006 in fact occurred, if the manufacturer wishes to contend that, although the violation occurred, the vehicle or engine configuration or engine family in question was not involved in the violation to a degree that would warrant suspension of certification under paragraph (e)(1)(v) of this section, he shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (e)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014 and

(ii) Not apply to vehicles or engines no longer in the hands of the manufacturer.

(7) Any voiding of a certificate of conformity under paragraph (e)(4) of this section shall be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014.

(Approved by the Office of Management and Budget under control numbers 2060-0049 and 2000-0390)

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§ 86.085-35 Labeling.

(a) The manufacturer of any motor vehicle (or motor vehicle engine) subject to the applicable emission standards of this subpart, shall, at the time of manufacture, affix a permanent legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles (or engines) available for sale to the public and covered by a certificate of conformity under § 86.085-30(a).

(1) *Light-duty vehicles.* (i) A permanent, legible label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been

ued the certificate of conformity for
h vehicle, in such a manner that it
not be removed without destroying
defacing the label. The label shall
be affixed to any equipment which
asily detached from such vehicle.

ii) The label shall contain the fol-
ing information lettered in the
glish language in block letters and
nerals, which shall be of a color
t contrasts with the background of
label:

) The label heading: Vehicle Emis-
n Control Information;

) Full corporate name and trade-
rk of manufacturer;

) Engine displacement (in cubic
hes), engine, family identification
l evaporative family identification;

) Engine tuneup specifications
l adjustments, as recommended by
manufacturer in accordance with
applicable emission standards, in-
ding but not limited to idle
ed(s), ignition timing, the idle air-
l mixture setting procedure and
ue (e.g., idle CO, idle air-fuel ratio,
speed drop), high idle speed, ini-
injection timing, and valve lash (as
licable), as well as other param-
s deemed necessary by the manu-
urer. These specifications should
cate the proper transmission posi-
during tune-up and what accesso-
(e.g., air conditioner), if any,
uld be in operation;

) An unconditional statement of
pliance with the appropriate
del year U.S. Environmental Pro-
ion Agency regulations which
ly to light-duty vehicles;

) [Reserved]

) For vehicles that have been ex-
pted from compliance with the
ssion standards at high altitude, as
cified in § 86.085-8(h),

) A highlighted statement (e.g., un-
scored or boldface letters) that the
icle is certified to applicable emis-
standards at low altitude only,

) A statement that the vehicle's
atisfactory performance under
n-altitude conditions makes it un-
able for principal use at high alti-
, and

) A statement that the emission
formance warranty provisions of 40
R Part 85, Subpart V do not apply
when the vehicle is tested at high altitude;

(H) For vehicles that have been exempted from compliance with the emission standards at low altitude, as specified in § 86.085-8(i),

(*1*) A highlighted statement (e.g., underscored or boldface letters) that the vehicle is certified to applicable emission standards at high altitude only, and

(*2*) A statement that emission performance warranty provisions of 40 CFR Part 85, Subpart V do not apply when the vehicle is tested at low altitude.

(2) *Light-duty trucks.* (i) A legible, permanent label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label.

(A) The label heading: Important Vehicle Information;

(B) Full corporate name and trademark of manufacturers;

(C) Engine displacement (in cubic inches) and engine family identification;

(D) Engine tune-up specifications and adjustments, as recommended by the manufacturer in accordance with the applicable emission standards, including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable), as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tune-up and what accessories (e.g., air conditioner), if any, should be in operation. If adjustments or modifications to the vehicle are necessary to insure compliance with emission standards at either high or low altitude, the manufacturer shall either include the instructions for such adjustments on the label, or indicate on the label where instructions for such adjustments may be found. The label shall indicate whether the engine tune-up or adjustment specifications are applicable to high altitude, low altitude, or both;

(E) The prominent statement: "This vehicle conforms to U.S. EPA regulations applicable to 19—- Model Year New Light-Duty Trucks."

(F) If the manufacturer is provided an alternate useful life period under the provisions of § 86.085-21(f), the prominent statement: "This vehicle has been certified to meet U.S. EPA standards for a useful-life period of ——— years or ——— miles of operation, whichever occurs first. This vehicle's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than years or miles (*e.g.*, hours, or miles only).

(G) A statement, if applicable, that the adjustments or modifications indicated on the label are necessary to ensure emission control compliance at the altitude specified.

(H) A statement, if applicable, that the high-altitude vehicle was designated or modified for principal use at high altitude. This statement must be affixed by the manufacturer at the time of assembly or by any dealer who performs the high-altitude modification or adjustment prior to sale to an ultimate purchaser.

(I) For vehicles that have been exempted from compliance with the high-altitude emission standards, as specified in § 86.085-9(g)(2),

(*1*) A highlighted statement (e.g., underscored or boldface letters) that the vehicle is certified to applicable emission standards at low altitude only,

(*2*) A statement that the vehicle's unsatisfactory performance under high-altitude conditions makes it unsuitable for principal use at high altitude, and

(*3*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart V do not apply when the vehicle is tested at high altitude;

(3) *Heavy-duty engines.* (i) A permanent legible label shall be affixed to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Important Engine Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family and model designations;

(D) Date of engine manufacture (month and year). The manufacturer may, in lieu of including the date of manufacture on the engine label, maintain a record of the engine manufacture dates. The manufacturer shall provide the date of manufacture records to the Administrator upon request;

(E) Engine specifications and adjustments as recommended by the manufacturer. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air conditioner), if any, should be in operation;

(F) For gasoline-fueled engines the label should include the idle speed, ignition timing, and the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), and valve lash;

(G) For diesel engines the label should include the advertised hp at rpm, fuel rate at advertised hp in mm3 stroke, valve lash, initial injection timing, and idle speed;

(H) The prominent statement: "This engine conforms to U.S. EPA regulations applicable to 19—— Model Year New Heavy-Duty Engines."

(I) If the manufacturer is provided with an alternate useful life period under the provisions of § 86.085-21(f), the prominent statement: "This engine family has been certified to meet U.S. EPA standards for a useful-life period of ——— miles or ——— hours of operation, whichever occurs first. This engine's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than miles or hours (*e.g.*, years, or hours only).

(J) *For diesel engines.* The prominent statement: "This engine has a primary intended service application as a ———-heavy-duty diesel engine." (The primary intended service applications are light, medium, and heavy, as defined in § 86.085–2.)

(K) For gasoline-fueled engines certified under the special provisions of § 86.085–10(e), the prominent statement: "This engine is certified for use outside of California only in Class A motor homes, under the special provisions of § 86.085–10(e), and may not be used in any other application."

(iv) The label may be made up of one or more pieces: *Provided,* That all pieces are permanently attached to the same engine or vehicle part as applicable.

(4)(i) *Gasoline-fueled heavy-duty vehicles.* A permanent, legible label shall be affixed in a readily visible position in the engine compartment. If such vehicles do not have an engine compartment, the label required in paragraphs (a)(4) and (g)(1) of this section shall be affixed in a readily visible position on the operator's enclosure or on the engine.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label.

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Evaporative family identification;

(D) The maximum nominal fuel tank capacity (in gallons) for which the evaporative control system is certified.

(E) An unconditioned statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to gasoline-fueled heavy-duty vehicles.

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle (or engine) conforms to any applicable state emission standards for new motor vehicles (or new motor vehicle engines) or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the vehicle (or engine).

(c)(1) The manufacturer of any light-duty vehicle or light-duty truck subject to the emission standards of this subpart shall, in addition and subsequent to setting forth those statements on the label required by the Department of Transportation (DOT) pursuant to 49 CFR 567.4, set forth on the DOT label or on an additional label located in proximity to the DOT label and affixed as described in 40 CFR 567.4(b), the following information in the English language, lettered in block letters and numerals not less than three thirty-seconds of an inch high, of a color that contrast with the background of the label:

(i) The Heading: "Vehicle Emission Control Information."

(ii)(A) *For light-duty vehicles,* the statement: "This Vehicle Conforms to U.S. EPA Regulations Applicable to 19—Model Year New Motor Vehicles."

(B) *For light-duty trucks.*

(*1*) The statement: "This vehicle conforms to U.S. EPA regulations applicable to 19—— Model Year New Light-Duty Trucks."

(*2*) If the manufacturer is provided an alternate useful life period under the provisions of § 86.085–21(f), the prominent statement: "This vehicle has been certified to meet U.S. EPA standards for a useful-life period of

—— years or ——— miles of operation, whichever occurs first. This vehicle's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than years or miles (*e.g.*, hours, or miles only).

(iii) One of the following statements, as applicable, in letters and numerals not less than six thirty-seconds of an inch high and of a color that contrasts with the background of the label:

(A) For all vehicles certified as non-catalyst-equipped: "NON-CATALYST".

(B) For all vehicles certified as catalyst-equipped which are included in a manufacturer's catalyst control program for which approval has been given by the Administrator: "CATALYST—APPROVED FOR IMPORT".

(C) For all vehicles certified as catalyst-equipped which are not included in a manufacturer's catalyst control program for which prior approval has been given by the Administrator: "CATALYST".

(2) In lieu of selecting either of the labeling options of paragraph (c)(1) of this section, the manufacturer may add the information required by paragraph (c)(1)(iii) of this section to the label required by paragraph (a) of this section. The required information will be set forth in the manner prescribed by paragraph (c)(1)(iii) of this section.

(d) Incomplete light-duty trucks or incomplete heavy-duty vehicles optionally certified as light-duty trucks shall have the following prominent statement printed on the label required by paragraph (a)(2) of this section in lieu of the statement required by paragraph of (a)(2)(iii)(E) of this section: "This vehicle conforms to U.S. EPA regulations applicable to 19—— Model Year New Light-Duty Trucks when completed at a maximum curb weight of ——— pounds or at a maximum gross vehicle weight rating of ——— pounds or with a maximum frontal area of ——— square feet."

(e) Incomplete heavy-duty vehicles having a gross vehicle weight rating of 8,500 pounds or less shall have one of the following statements printed on the label required by paragraph (a)(3) of this section in lieu of the statement required by paragraph (a)(3)(iii)(H) of this section: "This engine conforms to U.S. EPA regulations applicable to 19—— Model Year Heavy-Duty Engines when installed in a vehicle completed at a curb weight of more than 6,000 pounds or with a frontal area of greater than 45 square feet."

(f) The manufacturer of any incomplete light-duty vehicle or light-duty truck shall notify the purchaser of such vehicle of any curb weight, frontal area, or gross vehicle weight rating limitations affecting the emission certificate applicable to that vehicle. This notification shall be transmitted in a manner consistent with National Highway Traffic Safety Administration safety notification requirements published in 49 CFR Part 568.

(g)(1) Incomplete gasoline-fueled heavy-duty vehicles shall have the following prominent statement printed on the label required in paragraph (a)(4) of this section: "(Manufacturer's corporate name) has determined that this vehicle conforms to U.S. EPA regulations applicable to 19—— Model Year New Gasoline-Fueled Heavy-Duty Vehicles when completed with a nominal fuel tank capacity not to exceed ——— gallons. Persons wishing to add fuel tank capacity beyond the above maximum must submit a written statement to the Administrator that the hydrocarbon storage system has been upgraded according to the requirements of 40 CFR 86.085-35(g)(2)."

(2) Persons wishing to add fuel tank capacity beyond the maximum specified on the label required in paragraph (g)(1) of this section shall:

(i) Increase the amount of fuel tank vapor storage material according to the following function:

$$\text{Cap}_f = \text{Cap}_i \times \left(\frac{\text{T. Vol.}}{\text{Max. Vol.}}\right)$$

where:

Cap_f = final amount of fuel tank vapor storage material, grams.

Cap_i=initial amount of fuel tank vapor storage material, grams.

T. Vol.=total fuel volume of completed vehicle, gallons.

Max. Vol.=maximum fuel tank volume as specified on the label required in paragraph (g)(1) of this section, gallons.

(ii) Use, if applicable, hosing for fuel vapor routing which is at least as impermeable to hydrocarbon vapors as that used by the primary manufacturer.

(iii) Use vapor storage material with the same adsorptive characteristics as that used by the primary manufacturer.

(iv) Connect, if applicable, any new hydrocarbon storage device to the existing hydrocarbon storage device in series such that the original hydrocarbon storage device is situated between the fuel tank and the new hydrocarbon storage device. The original hydrocarbon storage device shall be sealed such that vapors cannot reach the atmosphere. The elevation of the original hydrocarbon storage device shall be equal to or lower than the new hydrocarbon storage device.

(v) Submit a written statement to the Administrator that paragraphs (g)(2) (i) through (iv) of this section have been complied with.

(3) If applicable, the Administrator will send a return letter verifying the receipt of the written statement required in paragraph (g)(2)(v) of this section.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 1453, Jan. 12, 1983, as amended at 48 FR 48616, Oct. 19, 1983; 48 FR 52191, Nov. 16, 1983; 49 FR 3021, Jan. 24, 1984; 49 FR 49832, Dec. 21, 1984; 50 FR 4514, Jan. 31, 1985]

§ 86.085-37 Production vehicles and engines.

(a) Any manufacturer obtaining certification under this part shall supply to the Administrator, upon request, a reasonable number of production vehicles (or engines) selected by the Administrator which are representative of the engines, emission control systems, fuel systems, and transmission offered and typical of production models available for sale under the certificate. These vehicles (or engines) shall be supplied for testing at such time and place and for such reasonable periods as the Administrator may require. Heavy-duty engines supplied under this paragraph may be required to be mounted in chassis and appropriately equipped for operation on a chassis dynamometer.

(b)(1) Any manufacturer of light-duty vehicles or light-duty trucks obtaining certification under this part shall notify the Administrator, on a yearly basis, of the number of vehicles domestically produced for sale in the United States and the number of vehicles produced and imported for sale in the United States during the preceding year. A manufacturer may elect to provide this information every 60 days instead of yearly by combining it with the notification required under § 86.079-36. The notification must be submitted 30 days after the close of the reporting period. The vehicle production information required shall be submitted as follow:

(i) Total production volume expressed in terms of units produced;

(ii) Model type production volume, expressed for each model type in terms of units produced and as a percentage of total production;

(iii) Base level production volume, expressed for each base level in terms of units produced and as percentage of:

(A) Total production of its respective model type(s), and

(B) Total production; and

(iv) Vehicle configuration production volume, expressed for each vehicle configuration in terms of units produced, and as a percentage of the total production of its respective base level. In addition, each vehicle configuration shall be identified by its appropriate engine-system combination.

(2) All light-duty vehicles and light-duty trucks covered by a certificate of conformity under § 86.082-30(a) shall be adjusted by the manufacturer to the ignition or injection timing specification detailed in § 86.079-36(a)(1)(iii)(D).

(c) Any heavy-duty engine or gasoline-fueled heavy-duty vehicle manufacturer obtaining certification under this part shall notify the Administrator, on a yearly basis, of the number of engines or vehicles of such engine family-evaporative emission family-engine displacement-exhaust emission control system-fuel system combination produced for sale in the United States during the preceding year.

(d) The following definitions apply to this section:

(1) "Model type" means a unique combination of car line, basic engine, and transmission class.

(2) "Base level" means a unique combination of basic engine, inertia weight, and transmission class.

(3) "Vehicle configuration" means a unique combination of basic engine, engine code, inertia weight, transmission configuration, and axle ratio within a base level.

[48 FR 1455, Jan. 12, 1983]

§ 86.085–38 Maintenance instructions.

(a) The manufacturer shall furnish or cause to be furnished to the purchaser of each new motor vehicle (or motor vehicle engine) subject to the standards prescribed in § 86.085–8, § 86.085–9, § 86.085–10, or § 86.085–11, as applicable, written instructions for the maintenance and use of the vehicle (or engine) by the purchaser as may be reasonable and necessary to assure the proper functioning of the emission control system.

(1) Such instructions shall be provided for those vehicle and engine components listed in Appendix VI to this part (and for any other components) to the extent that maintenance of these components is necessary to assure the proper functioning of the emission control system.

(2) Such instructions shall be in clear, and to the extent practicable, nontechnical language.

(b) The maintenance instructions required by this section shall contain a general description of the documentation which the manufacturer will require from the ultimate purchaser or any subsequent purchaser as evidence of compliance with the instructions.

(c) *For gasoline-fueled light-duty vehicles.* (1) Such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under § 86.085–25(a), and shall explain the conditions under which EGR system and catalytic converter maintenance are to be performed (e.g., what type of warning device is being employed and whether the device is activated by component failure or the need for periodic maintenance).

(2)—(3) [Reserved]

(d) *For diesel light-duty vehicles.* (1) Such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under § 86.085–25(a) and shall explain the conditions under which EGR system and catalytic converter maintenance are to be performed (e.g., what type of warning device is being employed and whether the device is activated by component failure or the need for periodic maintenance).

(2) [Reserved]

(e) *For light-duty trucks.* (1) Maintenance shall specify the performance of all scheduled emission-related maintenance approved by the Administrator under § 86.085–25(b). Scheduled emission-related maintenance in addition to that performed under § 86.085–25(b) may be recommended for reasons such as to offset the effects of operating conditions which differ from the conditions experienced during the determination of deterioration factors. Such additional recommended maintenance shall be clearly differentiated, in a form approved by the Administrator from that approved under § 86.085–25(b). The instructions may schedule maintenance on a calendar time basis, mileage basis, engine service time basis, or combinations of each.

(2) If the vehicle has been granted an alternative useful-life period under the provisions of § 86.085–21(f), and thus is required to comply with the labelling requirements set forth in paragraphs (a)(2)(iii)(F) and (c)(1)(ii)(B)(2) of § 86.085–35, the manufacturer may choose to include in such instructions an explanation of the distinction between the alternative useful life specified on the label, and the emissions defect and emissions performance warranty period. The explanation must clearly state that the useful life period specified on the label represents the average period of use up to retirement or rebuild for the engine family used in the vehicle. An explanation of how the actual useful lives of engines used

in various applications are expected to differ from the average useful life may be included. The explanation(s) shall be in clear, nontechnical language that is understandable to the ultimate purchaser.

(3) Such instructions shall indicate what adjustments or modifications, if any, are necessary to allow the vehicle to meet applicable emission standards at elevations above 4,000 feet, or at elevations of 4,000 feet or less.

(f) *For heavy-duty engines.* (1) Maintenance instructions shall specify the performance of all scheduled emission-related maintenance approved by the Administrator under § 86.085-25(b). Scheduled emission-related maintenance in addition to that performed under § 86.085-25(b) may be recommended for reasons such as to offset the effects of operating conditions which differ from the conditions experienced during the determination of deterioration factors. Such additional recommended maintenance shall be clearly differentiated, in a form approved by the Administrator from that approved under § 86.085-25(b). The instructions may schedule maintenance on a calendar time basis, mileage basis, engine service time basis, or combinations of each.

(2) If the engine has been granted an alternative useful-life period under the provisions of § 86.085-21(f), and thus is required to comply with the labelling requirements set forth in paragraph (a)(3)(iii)(J) of § 86.085-35, the manufacturer may choose to include in such instructions an explanation of the distinction between the useful life specified on the label, and the emissions defect and emissions performance warranty period. This explanation must clearly state that the useful life period specified on the label represents the estimated average period of use up to retirement or rebuild for the engine family. An explanation may be included of how the actual useful lives of engines used in various applications are expected to differ from the average useful life. The explanation(s) shall be in clear, nontechnical language that is understandable to the ultimate purchaser.

[48 FR 52192, Nov. 16, 1983]

§ 86.087-2 Definitions.

"Composite particulate standard" for a manufacturer which elects to average diesel light-duty vehicles and diesel light-duty trucks with a loaded vehicle weight equal to or less than 3,750 lbs (LDDT1s) together in the particulate averaging program, means that standard calculated according to the following equation and rounded to the nearest hundredth gram per mile:

$$\frac{(\mathrm{PROD}_{\mathrm{LDV}})(\mathrm{STD}_{\mathrm{LDV}})+(\mathrm{PROD}_{\mathrm{LDDT1}})(\mathrm{STD}_{\mathrm{LDDT1}})}{(\mathrm{PROD}_{\mathrm{LDV}})+(\mathrm{PROD}_{\mathrm{LDDT1}})}=\text{Manufacturer composite particulate standard}$$

Where:

$\mathrm{PROD}_{\mathrm{LDV}}$ represents the manufacturer's total light-duty vehicle production for those engine families being included in the average for a given model year.

$\mathrm{STD}_{\mathrm{LDV}}$ represents the light-duty vehicle particulate standard.

$\mathrm{PROD}_{\mathrm{LDDT1}}$ represents the manufacturer's total diesel light-duty truck production for those engine families with a loaded vehicle weight equal to or less than 3,750 lbs which are being included in the average for a given model year.

$\mathrm{STD}_{\mathrm{LDDT1}}$ represents the light-duty truck particulate standard for diesel light-duty trucks with a loaded vehicle weight equal to or less than 3,750 lbs.

"Production-weighted average" means the manufacturer's production-weighted average particulate emission level, for certification purposes, of all of its diesel engine families included in the particulate averaging program. It is calculated at the end of the model year by multiplying each family particulate emission limit by its respective production, summing these terms, and dividing the sum by the total production of the affected families. Those vehicles produced for sale in California or at high altitude shall each be averaged separately from those produced for sale in any other area. Diesel light-duty trucks with a loaded vehicle weight equal to or greater than 3,751 lbs (LDDT2s) shall only be averaged with other diesel light-duty trucks with a loaded vehicle weight equal to or greater than 3,751 lbs produced by that manufacturer.

[53 FR 43875, Oct. 31, 1988]

§ 86.087-8 Emission standards for 1987 light-duty vehicles.

(a) (1) Exhaust emissions from 1987 and later model year light-duty vehicles shall not exceed:

(i) *Hydrocarbons.* 0.41 grams per vehicle mile (0.26 grams per vehicle kilometer).

(ii) *Carbon monoxide.* 3.4 grams per vehicle mile (2.1 grams per vehicle kilometer).

(iii) *Oxides of nitrogen.* 1.0 grams per vehicle mile (0.63 grams per vehicle kilometer).

(iv) *Particulate emissions.* (diesels only). 0 20 gram per vehicle mile (0.12 grams per vehicle kilometer). A manufacturer may elect to include all or some of its diesel light-duty vehicle engine families in the particulate averaging program, provided that vehicles produced for sale in California or in designated high-altitude areas may be averaged only within each of these areas. If the manufacturer elects to average diesel light-duty vehicles and diesel light-duty trucks together in the particulate averaging program, its composite particulate standard applies to the combined set of diesel light-duty vehicles and diesel light-duty trucks included in the average and is calculated as defined in § 86.087-2.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures.

(b)(1) Fuel evaporative emissions from 1987 and later model year gasoline-fueled light-duty vehicles shall not exceed: *Hydrocarbons.* 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1987 and later model year gasoline-fueled light-duty vehicle.

(d)—(f) [Reserved]

(g) Any 1985 and later model year light-duty vehicle that a manufacturer wishes to certify for sale shall meet the emission standards under both low- and high-altitude conditions as specified in § 86.082-2, except as provided in paragraphs (h) and (i) of this section. Vehicles shall meet emission standards under both low- and high-altitude conditions without manual adjustments or modifications. Any emission control device used to meet emission standards under high-altitude conditions shall initially actuate (automatically) no higher than 4,000 feet above sea level.

(h) The manufacturer may exempt 1985 model year vehicles from compliance at high altitude with the emission standards set forth in paragraphs (a) and (b) of this section if the vehicles are not intended for sale at high altitude and if the requirements of paragraphs (h) (1) and (2) of this section are met.

(1) A vehicle configuration shall only be considered eligible for exemption under paragraph (h) of this section if the requirements of either paragraph (h)(1) (i), (ii), (iii), or (iv) of this section are met.

(i) Its design parameters (displacement-to-weight ratio (D/W) and engine speed-to-vehicle-speed ratio (N/V)) fall within the exempted range for that manufacturer for that year. The exempted range is determined according to the following procedure:

(A) The manufacturer shall graphically display the D/W and N/V data of all vehicle configurations it will offer for the model year in question. The axis of the abscissa shall be D/W (where (D) is the engine displacement expressed in cubic centimeters and (W) is the equivalent vehicle test weight expressed in pounds), and the axis of the ordinate shall be N/V (where (N) is the crankshaft speed expressed in revolutions per minute and (V) is the vehicle speed expressed in miles per hour). At the manufacturer's option, either the 1:1 transmission gear ratio or the lowest numerical gear ratio available in the transmission will be used to determine N/V. The gear selection must be the same for all N/V data points on the manufacturer's graph. For each transmission/axle ratio combination, only the lowest N/V value shall be used in the graphical display.

(B) The product line is then defined by the equation, $N/V=C(D/W)^{-0.9}$, where the constant, C, is determined by the requirement that all the vehicle data points either fall on the line or lie to the upper right of the line as displayed on the graphs.

(C) The exemption line is then defined by the equation, $N/V=C(0.84\ D/W)^{-0.9}$, where the constant, C is the same as that found in paragraph (h)(1)(i)(B) of this section.

(D) The exempted range includes all values of N/V and D/W which simultaneously fall to the lower left of the exemption line as drawn on the graph.

(ii) Its design parameters fall within the alternate exempted range for that manufacturer that year. The alternate exempted range is determined by substituting rated horsepower (hp) for displacement (D) in the exemption procedure described in paragraph (h)(1)(i) of this section and by using the product line $N/V=C(hp/W)^{-0.9}$.

(A) Rated horsepower shall be determined by using the Society of Automotive Engineers Test Procedure J 1349, or any subsequent version of that test procedure. Any of the horsepower determinants within that test procedure may be used, as long as it is used consistently throughout the manufacturer's product line in any model year.

(B) No exemptions will be allowed under paragraph (h)(1)(ii) of this subsection to any manufacturer that has exempted vehicle configurations as set forth in paragraph (h)(1)(i) of this section.

(iii) Its acceleration time (the time it takes a vehicle to accelerate from 0 miles per hour to a speed not less than 40 miles per hour and not greater than 50 miles per hour) under high-altitude conditions is greater than the largest acceleration time under low-altitude conditions for that manufacturer for that year. The procedure to be followed in making this determination is:

(A) The manufacturer shall list the vehicle configuration and acceleration time under low-altitude conditions of that vehicle configuration which has the highest acceleration time under low-altitude conditions of all the vehicle configurations it will offer for the model year in question. The manufacturer shall also submit a description of the methodology used to make this determination.

(B) The manufacturer shall then list the vehicle configurations and acceleration times under high-altitude conditions of all those vehicle configurations which have higher acceleration times under high-altitude conditions than the highest acceleration time at low altitude identified in paragraph (h)(1)(iii)(A) of this section.

(iv) In lieu of performing the test procedure of paragraphs (h)(1)(iii) (A) and (B) of this section, its acceleration time can be estimated based on the manufacturer's engineering evaluation, in accordance with good engineering practice, to meet the exemption criteria of paragraph (h)(1)(iii) of this section.

(2) A vehicle shall only be considered eligible for exemption under this paragraph if at least one configuration of its model type (and transmission configuration in the case of vehicles equipped with manual transmissions, excluding differences due to the presence of overdrive) is certified to meet emission standards under high-altitude conditions as specified in paragraphs (a) through (g) of this section. The Certificate of Conformity (the Certificate) covering any exempted configuration(s) will also apply to the corresponding non-exempt configuration(s) required under this paragraph. As a condition to the exemption, any suspension, revocation, voiding, or withdrawal of the Certificate as it applies to a non-exempt configuration for any reason will result in a suspension of the Certificate as it applies to the corresponding exempted configuration(s) of that model type, unless there is at least one other corresponding non-exempt configuration of the same model type still covered by the Certificate. The suspension of the

Certificate as it applies to the exempted configuration(s) will be terminated when any one of the following occurs:

(i) Another corresponding nonexempt configuration(s) receive(s) coverage under the Certificate; or

(ii) Suspension of the Certificate as it applies to the corresponding nonexempt configuration(s) is terminated; or

(iii) The Agency's action(s), with respect to suspension, revocation, voiding or withdrawal of the Certificate as it applies to the corresponding nonexempt configuration(s), is reversed.

(3) The sale of a vehicle for principal use at a designated high-altitude location that has been exempted as set forth in paragraph (h) of this section will be considered a violation of Section 203(a)(1) of the Clean Air Act.

(i)(1) The manufacturers may exempt 1985 and later model year vehicles from compliance at low altitude with the emission standards set forth in paragraphs (a) and (b) of this section if the vehicles:

(A) Are not intended for sale at low altitude; and

(B) Are equippped with a unique, high-altitude axle ratio (rear-wheel drive vehicles) or a unique, high-altitude drivetrain (front-wheel drive vehicles) with a higher N/V ratio than other configurations of that model type which are certified in compliance with the emission standards of paragraphs (a) and (b) of this section under low-altitude conditions.

(2) The sale of a vehicle for principal use at low altitude that has been exempted as set forth in paragraph (h)(1) of this section will be considered a violation of section 203(a)(1) of the Clean Air Act.

[49 FR 3021, Jan. 24, 1984, as amended at 52 FR 47863, Dec. 16, 1987]

§ 86.087-9 Emission standards for 1987 and later model year light-duty trucks.

(a)(1) The standards set forth in paragraphs (a) through (c) of this section shall apply to light-duty trucks sold for principal use at other than a designated high-altitude location. Exhaust emissions from 1987 and later model year light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 0.80 gram per vehicle mile (0.50 gram per vehicle kilometer).

(ii)(A) *Carbon monoxide.* 10 grams per vehicle mile (6.2 grams per vehicle kilometer).

(B) *Gasoline-fueled vehicles.* 0.50 percent of exhaust gas flow at curb idle.

(iii) *Oxides of nitrogen.* 2.3 grams per vehicle mile (1.4 grams per vehicle kilometer).

(iv) *Particulate emissions* (diesels only).

(A) For light-duty trucks up to and including 3,750 lbs loaded vehicle weight, 0.26 grams per vehicle mile (0.16 grams per vehicle kilometer).

(B) For light-duty trucks 3,751 lbs and greater loaded vehicle weight, 0.50 grams per vehicle mile (0.31 grams per vehicle kilometer).

(C) A manufacturer may elect to include all or some of its light-duty truck engine families subject to the standard of paragraph (a)(1)(iv)(A) of this section in the particulate averaging program, provided that trucks produced for sale in California or in designated high-altitude areas may be averaged only within each of those areas. If the manufacturer elects to average together particulate emissions of light-duty trucks subject to the standard of paragraph (a)(1)(iv)(A) of this section with the particulate emissions of diesel light-duty vehicles, its composite particulate standard applies to the combined fleets of those light-duty trucks and diesel light-duty vehicles included in the average and is calculated as defined in § 86.085-2.

(2) The standards set forth in paragraphs (a)(1)(i), (a)(1)(ii)(A), (a)(1)(iii), and (a)(1)(iv) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures. The standard set forth in paragraph (a)(1)(ii)(B) of this section refers to the exhaust emitted at curb idle and measured and calculated in accordance with the procedures set forth in Subpart P of this part.

(b)(1) Fuel evaporative emissions from 1987 and later model year gasoline-fueled light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1987 and later model year light-duty truck.

(d)(1) Model year 1987 and later light-duty trucks sold for principal use at a designated high-altitude location shall be capable of meeting the following exhaust emission standards when tested under high-altitude conditions:

(i) *Hydrocarbons.* 1.0 grams per vehicle mile (0.62 grams per vehicle kilometer);

(ii) *Carbon monoxide.* 14 grams per vehicle mile (8.7 grams per vehicle kilometer);

(iii) *Oxides of nitrogen.* 2.3 grams per vehicle mile (1.4 grams per vehicle kilometer).

(iv) *Particulate emissions* (diesels only). For light-duty trucks up to and including 3,750 lbs. loaded vehicle weight, 0.26 grams per vehicle mile (0.16 grams per vehicle kilometer).

(2) The standards set forth in paragraph (d)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures.

(e)(1) Fuel evaporative emissions from 1987 and later model year gasoline-fueled light-duty trucks sold for principal use at a designated high-altitude location shall not exceed 2.6 grams per test when tested under high-altitude conditions.

(2) The standard set forth in paragraph (e)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(f) No crankcase emissions shall be discharged into the ambient atmosphere from any 1987 and later model year light-duty trucks sold for principal use at a designated high-altitude location.

(g)(1) Any light-duty truck that a manufacturer wishes to certify for sale at low altitude must be capable of meeting high-altitude emission standards (specified in paragraphs (d) through (f) of this section). The manufacturer may specify vehicle adjustments or modifications to allow the vehicle to meet high-altitude standards but these adjustments or modifications may not alter the vehicle's basic engine, inertia weight class, transmission configuration, and axle ratio.

(i) A manufacturer may certify unique configurations to meet the high-altitude standards but is not required to certify these vehicle configurations to meet the low-altitude standards.

(ii) Any adjustments or modifications that are recommended to be performed on vehicles to satisfy the requirements of paragraph (g)(1) of this section:

(A) Shall be capable of being effectively performed by commercial repair facilities.

(B) Must be included in the manufacturer's application for certification.

(2) The manufacturer may exempt 1985 and later model year vehicles from compliance with the high-altitude emission standards set forth in paragraphs (d) and (e) of this section if the vehicles are not intended for sale at high altitude and if the following requirements are met. A vehicle configuration shall only be considered eligible for exemption if the requirements of either paragraph (g)(2) (i), (ii), (iii), or (iv) of this section are met.

(i) Its design parameters (displacement-to-weight ratio (D/W) and engine speed-to-vehicle-speed ratio (N/V)) fall within the exempted range for that manufacturer for that year. The exempted range is determined according to the following procedure:

(A) The manufacturer shall graphically display the D/W and N/V data of all vehicle configurations it will offer for the model year in question. The axis of the abscissa shall be D/W (where (D) is the engine displacement expressed in cubic centimeters and (W) is the gross vehicle weight (GVW) expressed in pounds), and the axis of the ordinate shall be N/V (where (N) is the crankshaft speed expressed in revolutions per minute and (V) is the vehicle speed expressed in miles per hour). At the manufacturer's option, either the 1:1 transmission gear ratio or the lowest numerical gear ratio available in the transmission will be used to determine N/V. The gear selection must be the same for all N/V data points on the manufacturer's graph. For each transmission/axle ratio combination, only the lowest N/V value shall be used in the graphical display.

(B) The product line is then defined by the equation, $N/V=C(D/W)^{-0.9}$, where the constant, C, is determined by the requirement that all the vehicle data points either fall on the line or lie to the upper right of the line as displayed on the graphs.

(C) The exemption line is then defined by the equation, $N/V=C(0.84\ D/W)^{-0.9}$, where the constant, C is the same as that found in paragraph (g)(2)(i)(B) of this section.

(D) The exempted range includes all values of N/V and D/W which simultaneously fall to the lower left of the exemption line as drawn on the graph.

(ii) Its design parameters fall within the alternate exempted range for that manufacturer that year. The alternate exempted range is determined by substituting rated horsepower (hp) for displacement (D) in the exemption procedure described in paragraph (g)(2)(i) of this section and by using the product line $N/V=C(hp/W)^{-0.9}$.

(A) Rated horsepower shall be determined by using the Society of Automotive Engineers Test Procedure J 1349, or any subsequent version of that test procedure. Any of the horsepower determinants within that test procedure may be used, as long as it is used consistently throughout the manufacturer's product line in any model year.

(B) No exemptions will be allowed under paragraph (g)(2)(ii) of this section to any manufacturer that has exempted vehicle configurations as set forth in paragraph (g)(2)(i) of this section.

(iii) Its acceleration time (the time it takes a vehicle to accelerate from 0 to a speed not less than 40 miles per hour and not greater than 50 miles per hour) under high-altitude conditions is greater than the largest acceleration time under low-altitude conditions for that manufacturer for that year. The procedure to be followed in making this determination is:

(A) The manufacturer shall list the vehicle configuration and acceleration time under low-altitude conditions of that vehicle configuration which has the highest acceleration time under low-altitude conditions of all the vehicle configurations it will offer for the model year in question. The manufacturer shall also submit a description of the methodology used to make this determination.

(B) The manufacturer shall then list the vehicle configurations and acceleration times under high-altitude conditions of all those vehicle configurations which have higher acceleration times under high-altitude conditions than the highest acceleration time at low altitude identified in paragraph (g)(2)(iii)(A) of this section.

(iv) In lieu of performing the test procedure of paragraph (g)(2)(iii) of this section, its acceleration time can be estimated based on the manufacturer's engineering evaluation, in accordance with good engineering practice, to meet the exemption criteria of paragraph (g)(2)(iii) of this section.

(3) The sale of a vehicle for principal use at a designated high-altitude location that has been exempted as set forth in paragraph (g)(2) of this section will be considered a violation of Section 203(a)(1) of the Clean Air Act.

[49 FR 3022, Jan. 24, 1984, as amended at 50 FR 10650, Mar. 15, 1985; 51 FR 24608, July 7, 1986; 52 FR 47864, Dec. 16, 1987; 53 FR 43876, Oct. 31, 1988]

§ 86.087-10 Emission standards for 1987 and later model year gasoline-fueled heavy-duty engines and vehicles.

(a)(1) Exhaust emissions from new 1987 and later model year gasoline-fueled heavy-duty engines shall not exceed:

(i) For engines intended for use in all vehicles except as provided in paragraph (a)(3) of this section,

(A) *Hydrocarbons*. 1.1 grams per brake horsepower-hour, as measured transient under operating conditions.

(B) *Carbon monoxide.* (*1*) 14.4 grams per brake horsepower-hour, as measured under transient operating conditions.

(*2*) *Gasoline-fueled heavy-duty engines utilizing aftertreatment technology.* 0.50 percent of exhaust gas flow at curb idle.

(C) *Oxides of nitrogen.* 10.6 grams per brake horsepower-hour, as measured under transient operating conditions.

(ii) For engines intended for use only in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 pounds,

(A) *Hydrocarbons.* 1.9 grams per brake horsepower-hour as measured under transient operating conditions.

(B) *Carbon Monoxide.* (*1*) 37.1 grams per brake horsepower-hour as measured under transient operating conditions.

(*2*) *Gasoline-fueled heavy-duty engines utilizing aftertreatment technology.* 0.50 percent of exhaust gas flow at curb idle.

(C) *Oxides of nitrogen.* 10.6 grams per brake horsepower-hour, as measured under transient operating conditions.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over the operating schedule set forth in paragraph (f)(1) of Appendix I to this part, and measured and calculated in accordance with the procedures set forth in Subparts N or P.

(3)(i) A manufacturer may certify one or more gasoline-fueled heavy-duty engine configurations intended for use in all vehicles to the emission standards set forth in paragraph (a)(1)(ii) of this section. *Provided,* That, the total model year sales of such configuration(s) being certified to the emission standards in paragraph (a)(1)(ii) of this section represent no more than 5 percent of total model year sales of all gasoline-fueled heavy-duty engines intended for use in vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds by the manufacturer.

(ii) The configurations certified to the emission standards of paragraph (a)(1)(ii) of this section under the provisions of paragraph (a)(3)(i) of this section shall still be required to meet the evaporative emission standards set forth in paragraphs (b)(1)(i)(A) and (b)(2)(i) of this section.

(b)(1) Evaporative emissions from 1987 and later model year gasoline-fueled heavy-duty vehicles shall not exceed:

(i) *Hydrocarbons.* (A) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds, 3.0 grams per test.

(B) For vehicles with a Gross Vehicle Weight Rating of greater than 14,000 pounds, 4.0 grams per test.

(2)(i) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, the standards set forth in paragraph (b)(1) of this section refer to a composite sample of fuel evaporative emissions collected under the conditions set forth in Subpart M and measured in accordance with those procedures.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 26,000 pounds, the standard set forth in paragraph (b)(1)(i)(B) of this section refers to the manufacturer's engineering design evaluation using good engineering practice (a statement of which is required in § 86.085-23(b)(4)(ii)).

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1987 or later model year gasoline-fueled heavy-duty engine.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subpart N or P of this part to ascertain that such test engines meet the requirements of paragraphs (a) and (c) of this section.

[48 FR 52193, Nov. 16, 1983]

§ 86.087-21 Application for certification.

(a) A separate application for a certificate of conformity shall be made for each set of standards (or family particulate emission limits, as appropriate) and each class of new motor vehicles or new motor vehicle engines.

Such application shall be made to the Administrator by the manufacturer and shall be updated and corrected by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1)(i) Identification and description of the vehicles (or engines) covered by the application and a description of their engine (vehicles only), emission control system and fuel system components. This shall include a detailed description of each auxiliary emission control device (AECD) to be installed in or on any certification test vehicle (or certification test engine).

(ii)(A) The manufacturer shall provide to the Administrator in the preliminary application for certification:

(*1*) A list of those parameters which are physically capable of being adjusted (included those adjustable parameters for which access is difficult) and that, if adjusted to settings other than the manufacturer's recommended setting, may affect emissions;

(*2*) A specification of the manufacturer's intended physically adjustable range of each such parameter, and the production tolerances of the limits or stops used to establish the physically adjustable range;

(*3*) A description of the limits or stops used to establish the manufacturer's intended physically adjustable range of each adjustable parameter, or any other means used to inhibit adjustment;

(*4*) The nominal or recommended setting, and the associated production tolerances, for each such parameter.

(B) The manufacturer may provide, in the preliminary application for certification, information relating to why certain parameters are not expected to be adjusted in actual use and to why the physical limits or stops used to establish the physically adjustable range of each parameter, or any other means used to inhibit adjustment, are expected to be effective in preventing adjustment of parameters on in-use vehicles to settings outside the manufacturer's intended physically adjustable ranges. This may include results of any tests to determine the difficulty of gaining access to an adjustment or exceeding a limit as intended or recommended by the manufacturer.

(C) The Administrator may require to be provided detailed drawings and descriptions of the various emission related components, and/or hardware samples of such components, for the purpose of making his determination of which vehicle or engine parameter will be subject to adjustment for new certifcation and Selective Enforcement Audit testing and of the physically adjustable range for each such vehicle or engine parameter.

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles (or engines) for which certification is requested. The sales data shall also include the altitude of intended sale for light-duty trucks.

(3) A description of the test equipment and fuel proposed to be used.

(4)(i) For light-duty vehicles and light-duty trucks, a description of the test procedures to be used to establish the evaporative emission deterioration factors required to be determined and supplied in §86.085-23(b)(2).

(ii) For gasoline-fueled heavy-duty vehicles, the Administrator does not assume that each evaporative emission family-evaporative emission control system combination will deteriorate in a unique manner during the useful life of the vehicle. The manufacturer shall therefore identify those evaporative emission deterioration factors which shall be applied to the various evaporative emission family-evaporative emission control system combinations which are expected to exhibit similar deterioration characteristics during the useful life of the vehicle.

(iii)(A) A description of the test procedures to be used to establish the durability data or the exhaust emission deterioration factors required to be determined and supplied in § 86.085-23(b)(1).

(B)(*1*) For engine families provided an alternative useful-life period under paragraph (f) of this section, a statement of that alternative period and a brief synopsis of the justification.

(*2*) For heavy-duty diesel engine families, a statement of the primary intended service class (light, medium, or heavy) and an explanation as to why that service class was selected. Each diesel engine family shall be certified under one primary intended service class only. After reviewing the guidance in § 86.085-2, the class shall be determined on the basis of which class best represents the majority of the sales of that engine family.

(C)(*1*) For each light-duty truck engine family and each heavy-duty engine family, a statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(*2*) A description of vehicle adjustments or modifications necessary, if any, to assure that light-duty trucks covered by a certificate of conformity conform to the regulations while being operated at any altitude locations, and a statement of the altitude at which the adjustments or modifications apply.

(D) At the option of the manufacturer, the proposed composition of the emission-data test fleet or (where applicable) the durability-data test fleet.

(5) If the manufacturer elects to participate in the particulate averaging program for diesel light-duty vehicles and/or diesel light-duty trucks, the application must list the family particulate emission limit and the projected U.S. production volume of the family for the model year.

(i) The manufacturer shall choose the level of the family particulate emission limits, accurate to one-hundredth of a gram per mile.

(ii) The manufacturer may at any time during production elect to change the level of any family diesel particulate emission limit(s) by submitting the new limit(s) to the Administrator and by demonstrating compliance with the limit(s) as described in § 86.085-2 and § 86.085-28(b)(5).

(6)(i) For gasoline-fueled heavy-duty engines, the application must state whether the engine family is being certified for use in all vehicles regardless of their Gross Vehicle Weight Rating (see § 86.087-10(a)(1)(i) and (a)(3)(i)), or, only for use in vehicles with a Gross Vehicle Weight Rating greater than 14,000 pounds.

(ii) If the engine family is being certified for use in all vehicles and, is being certified to the emission standards applicable to gasoline-fueled heavy-duty engines for use only in vehicles with a Gross Vehicle Weight Rating over 14,000 pounds under the provisions of paragraph (a)(3) of § 86.087-10, then the application must also attest that the engine family, together with all other engine families being certified under the povisions of paragraph (a)(3) of § 86.087-10, represent no more than 5 percent of model year sales of the manufacturer of all gasoline-fueled heavy-duty engines for use in vehicles with Gross Vehicle Weight Ratings of up to 14,000 pounds.

(iii)(A) A description of the test procedures to be used to establish the durability data or the exhaust emission deterioration factors required to be determined and supplied in § 86.087-23(b)(1).

(B)(*1*) A statement of the useful life of use of each light-duty truck engine family and heavy-duty engine family.

(*2*) For engine families provided an alternative useful life period under paragraph (f) of this section, a statement of that alternative period and a brief synopsis of the justification.

(*3*) For heavy-duty diesel engine families, a statement of the primary intended service class (light, medium, or heavy) and an explanation as to why that service class was selected. Each diesel engine family shall be certified under one primary intended service class only. After reviewing the guidance in § 86.085-2, the class shall be determined on the basis of which class best represents the majority of the sales of that engine family.

(C)(*1*) For each light-duty truck engine family and each heavy-duty engine family, a statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(*2*) A description of vehicle adjustments or modifications necessary, if any, to assure that light-duty trucks covered by a certificate of conformity conform to the regulations while being operated at any altitude locations, and a statement of the altitude at which the adjustments or modifications apply.

(D) At the option of the manufacturer, the proposed composition of the emission-data test fleet or (where applicable) the durability-data test fleet.

(7) For each light-duty vehicle engine family, a statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(8) For each light-duty vehicle engine family, the proposed composition of the emission-data test fleet and the durability-data test fleet.

(c) Complete copies of the application and of any amendments thereto, and all notifications under §§ 86.079-32, 86.079-33, and 86.079-34 shall be submitted in such multiple copies as the Administrator may require.

(d) Incomplete light-duty trucks shall have a maximum completed curb weight and maximum completed frontal area specified by the manufacturer.

(e) For gasoline-fueled heavy-duty vehicles the manufacturer shall specify a maximum nominal fuel tank capacity for each evaporative emission family-evaporative emission control system combination.

(f) Light-duty truck and heavy-duty engine manufacturers who believe that the useful life periods of § 86.085-2 are significantly unrepresentative for one or more engine families (either too long or too short), may petition the Administrator to provide an alternative useful-life period. This petition must include the full rationale behind the request together with any supporting data and other evidence. Based on this or other information the Administrator may assign an alternative useful-life period. Any petition should be submitted in a timely manner, to allow adequate time for a thorough evaluation.

[48 FR 52193, Nov. 16, 1983, as amended at 52 FR 47864, Dec. 16, 1987]

§ 86.087-23 Required data.

(a) The manufacturer shall perform the tests required by the applicable test procedures, and submit to the Administrator the following information: *Provided, however,* That if requested by the manufacturer, the Administrator may waive any requirement of this section for testing of vehicle (or engine) for which emission data are available or will be made available under the provisions of § 86.085-29.

(1)—(2) [Reserved]

(b)(1)(i) Exhaust emission durability data on such light-duty vehicles tested in accordance with applicable test procedures and in such numbers as specified, which will show the performance of the systems installed on or incorporated in the vehicle for extended mileage, as well as a record of all pertinent maintenance performed on the test vehicles.

(ii) Exhaust emission deterioration factors for light-duty trucks and heavy-duty engines and all test data that are derived from the testing described under § 86.085-21(b)(4)(iii)(A) as well as a record of all pertinent maintenance. Such testing shall be designed and conducted in accordance with good engineering practice to assure that the engines covered by a certificate issued under § 86.085-30 will meet the emission standards (or family particulate emission limits, as appropriate) in § 86.085-09, § 86.087-10, or § 86.085-11 as appropriate, in actual use for the useful life of the engine.

(2) For light-duty vehicles and light-duty trucks, evaporative emission deterioration factors for each evaporative emission family-evaporative emission control system combination and all test data that are derived from testing described under § 86.085-21(b)(4)(i) designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.085-30 will meet the evaporative emission standards in § 86.085-8 or § 86.085-9, as

appropriate, for the useful life of the vehicle.

(3) For gasoline-fueled heavy-duty vehicles, evaporative emission deterioration factors for each evaporative emission family-evaporative emission control system combination identified in accordance with § 86.087-21(b)(4)(ii). Furthermore, a statement that the test procedure(s) used to derive the deterioration factors includes, but need not be limited to, a consideration of the ambient effects of ozone and temperature fluctuations, and the service accumulation effects of vibration, time, and vapor saturation and purge cycling. The deterioration factor test procedure shall be designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.085-30 will meet the evaporative emission standards in § 86.085-10 in actual use for the useful life of the engine. Furthermore, a statement that a description of the test procedure, as well as all data, analyses and evaluations, is available to the Administrator upon request.

(4)(i) For gasoline-fueled, heavy-duty vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, a written statement to the Administrator certifying that the manufacturer's vehicles meet the standards of § 86.085-10 as determined by the provisions of § 86.085-28. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations, and other documents, on which the above statement is based, are available to the Administrator upon request.

(ii) For gasoline-fueled, heavy-duty vehicles with a Gross Vehicle Weight Rating of greater than 26,000 pounds, a written statement to the Administrator certifying that the manufacturer's evaporative emission control systems are designed, using good engineering practice, to meet the standards of § 86.085-10 as determined by the provisions of § 86.085-28. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations, and other documents, on which the above statement is based, are available to the Administrator upon request.

(c) *Emission data.* (1)(i) Emission data on such vehicles tested in accordance with applicable test procedures and in such numbers as specified. These data shall include zero-mile data, if generated, and emission data generated for certification as required under § 86.084-26(a)(3)(i) or § 86.084-26(a)(3)(ii).

(ii) [Reserved]

(2) *Certification engines.* (i) Emission data on such engines tested in accordance with applicable emission test procedures of this subpart and in such numbers as specified. These data shall include zero-hour data, if generated, and emission data generated for certification as required under § 86.082-26(b)(5). In lieu of providing emission data on CO emissions from diesel certification engines the Administrator may, on request of the manufacturer, allow the manufacturer to demonstrate (on the basis of previous emission tests, development tests, or other information) that the engine will conform with the CO emission standard of § 86.085-11.

(ii) For heavy-duty diesel engines, a manufacturer may submit hot-start data only, in accordance with Subpart N, when making application for certification. However, for conformity SEA and recall testing by the Agency, both the cold-start and hot-start test data, as specified in Subpart N, will be included in the official results.

(d) A statement that the vehicles (or engines) for which certification is requested conform to the requirements in § 86.084-5(b), and that the descriptions of tests performed to ascertain compliance with the general standards in § 86.084-5(b), and the data derived from such tests, are available to the Administrator upon request.

(e)(1) A statement that the test vehicles (or test engines) with respect to which data are submitted to demonstrate compliance with the applicable standards (or family particulate emission limits, as appropriate) of this subpart are in all material respects as described in the manufacturer's application for certification, have been tested in accordance with the applicable test procedures utilizing the fuels and equipment described in the application for certification and that on the basis of such tests the vehicles (or engines) conform to the requirements of this part. If such statements cannot be made with respect to any vehicle (or engine) tested, the vehicle (or engine) shall be identified, and all pertinent data relating thereto shall be supplied to the Administrator. If, on the basis of the data supplied and any additional data as required by the Administrator, the Administrator determines that the test vehicles (or test engine) was not as described in the application for certification or was not tested in accordance with the applicable test procedures utilizing the fuels and equipment as described in the application for certification, the Administrator may make the determination that the vehicle (or engine) does not meet the applicable standards (or family particulate emission limits, as appropriate). The provisions of § 86.084-30(b) shall then be followed.

(2) For evaporative emission durability, or light-duty truck or heavy-duty engine exhaust emission durability, a statement of compliance with paragraph (b)(1)(ii), (b)(2), or (b)(3) of this section, as applicable.

(f) Additionally, manufacturers participating in the diesel particulate averaging program shall submit:

(1) In the application for certification, a statement that the vehicles for which certification is requested will not, to the best of the manfacturer's belief, when included in the manufacturer's production-weighted average emission level, cause the applicable particulate standard(s) to be exceeded.

(2) No longer than 90 days after the end of a given model year of production of engine families included in the diesel particulate averaging program, the number of vehicles produced in each engine family at each certified family diesel particulate emission limit, along with the resulting production-weighted average particulate emission level.

(g) If the manufacturer elects to use a measurement procedure other than that specified in Subpart I to determine compliance with the standards of § 86.085-11(b), the manufacturer will:

(1) Determine the correlation between the alternative measurement procedure chosen and the procedure set forth in Subpart I for each of the opacity measurements required in § 86.085-11(b).

(2) Maintain a description of the procedure and test(s) used to determine the correlation and the data derived from such tests.

(3) Make available to the Administrator, upon request, any of the information or data required in paragraphs (g) (1) and (2), and

(4) For each engine family for which a certificate is requested:

(i) Provide a statement that the results obtained by the alternative measurement procedure correlate with the results which would be expected when determined by the procedure in Subpart I, and

(ii) Provide these results, adjusted if necessary with the applicable correlation offset, to be compared with the opacity standards of § 86.085-11(b).

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[48 FR 52195, Nov. 16, 1983, as amended at 50 FR 10657, Mar. 15, 1985]

§ 86.087-25 Maintenance.

(a) *Applicability.* This section applies to light-duty vehicles, light-duty trucks, and heavy-duty engines. Manufacturers of light-duty vehicles may elect the option of complying with § 86.085-25(a) for any engine family.

(1) Maintenance performed on vehicles, engines, subsystems, or components used to determine exhaust or evaporative emission deterioration factors is classified as either emission-related or non emission-related and each of these can be classified as either scheduled or unscheduled.

(b) This section specifies emission-related scheduled maintenance for purposes of obtaining durability data and for inclusion in maintenance instructions furnished to purchasers of new motor vehicles and new motor vehicle engines under § 86.087-38.

(1) All emission-related scheduled maintenance for purposes of obtaining durability data must occur at the same mileage intervals (or equivalent inter-

vals if engines, subsystems, or components are used) that will be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle or engine under §86.087-38. This maintenance schedule may be updated as necessary throughout the testing of the vehicle/engine provided that no maintenance operation is delected from the maintenance schedule after the operation has been performed on the test vehicle or engine.

(2) Any emission-related maintenance which is performed on vehicles, engines, subsystems, or components must be technologically necessary to assure in-use compliance with the emission standards. The manufacturer must submit data which demonstrate to the Administrator that all of the emission-related scheduled maintenance which is to be performed is technologically necessary. Scheduled maintenance must be approved by the Administrator prior to being performed or being included in the maintenance instructions provided to purchasers under § 86.087-38. As provided below, EPA has determined that emission-related maintenance at shorter intervals than that outlined in paragraphs (b)(3) and (b)(4) of this section is not technologically necessary to ensure in-use compliance. However, the Administrator may determine that maintenance even more restrictive (*e.g.*, long intervals) than that listed in paragraphs (b)(3) and (b)(4) of this section is also not technologically necessary.

(3) For gasoline-fueled light-duty vehicles, light-duty trucks and heavy-duty engines, emission-related maintenance in addition to, or at shorter intervals than, the following will not be accepted as technologically necessary, except as provided in paragraph (b)(7) of this section.

(i)(A) The cleaning or replacement of light-duty vehicle or light-duty truck spark plugs at 30,000 miles of use and at 30,000-mile intervals thereafter.

(B) The cleaning or replacement of gasoline-fueled heavy-duty engine spark plugs at 12,000 miles (or 360 hours) of use and at 12,000-mile (or 360-hour) intervals thereafter, for engine certified for use with leaded fuel.

(C) The cleaning or replacement of gasoline-fueled heavy-duty engine spark plugs at 25,000 miles (or 750 hours) of use and at 25,000-mile (or 750-hour) intervals thereafter, for engines certified for use with unleaded fuel only.

(ii) For light-duty vehicles, the adjustment, cleaning, repair, or replacement of the following may not be performed within the 50,000-mile useful life of the vehicle:

(A) Positive crankcase ventilation valve.

(B) Emission-related hoses and tubes.

(C) Ignition wires.

(D) Carburetors (including idle mixture).

(E) Catalytic converter.

(F) Exhaust gas recirculation system (including all related filters and control valves).

(G) Air injection system components.

(H) Fuel injectors.

(I) Electronic engine control unit and its associated sensors (including oxygen sensor) and actuators.

(J) Evaporative emission canister.

(K) Turbochargers.

(iii) For light-duty trucks and heavy-duty engines, the adjustment, cleaning, repair, or replacement of the following at 50,000 miles (or 1,500 hours) of use and at 50,000-mile (or 1,500-hour) intervals thereafter:

(A) Positive crankcase ventilation valve.

(B) Emission-related hoses and tubes.

(C) Ignition wires.

(D) Idle mixture.

(E) Oxygen sensor.

(iv) [Reserved]

(v) For light-duty trucks and heavy-duty engines, the adjustment, cleaning, repair, or replacement of the following at 100,000 miles (or 3,000 hours) of use and at 100,000-mile (or 3,000-hour) intervals thereafter:

(A) Catalytic converter.

(B) Fuel injectors.

(vi)(A) For heavy-duty engines certified for use with leaded fuel, the adjustment, cleaning, repair, or replacement of the exhaust gas recirculation

(EGR) system (including all related filters and control valves) at 24,000 miles (or 720 hours) of use and at 24,000-mile (or 720-hour) intervals thereafter.

(B) For light-duty trucks, and for heavy-duty engines certified for use with unleaded fuel only, the adjustment, cleaning, repair, or replacement of the EGR system (including all related filters and control valves) at 50,000 miles (or 1,500 hours) of use and at 50,000-mile (or 1,500-hour) intervals thereafter.

(4) For diesel powered light-duty vehicles, light-duty trucks, and heavy-duty engines, emission-related maintenance in addition to, or at shorter intervals than, the following will not be accepted as technologically necessary, except as provided in paragraph (b)(7) of this section.

(i) For light-duty vehicles, the adjustment, cleaning, repair, or replacement of the following may not be performed within the 50,000-mile useful life of the vehicle:

(A) Exhaust gas recirculation system (including all related filters and control valves).

(B) Positive crankcase ventilation valve.

(C) Fuel injectors.

(D) Turbocharger.

(ii) For light-duty trucks and heavy-duty engines, the adjustment, cleaning, repair, or replacement of the following at 50,000 miles (or 1,500 hours) of use and at 50,000-mile (or 1,500-hour) intervals thereafter:

(A) Exhaust gas recirculation system (including all related filters and control valves).

(B) Positive crankcase ventilation valve.

(C) Fuel injector tip (cleaning *only*).

(iii) The adjustment, cleaning, repair, or replacement of the following at 100,000 miles (or 3,000 hours) of use and at 100,000-mile (or 3,000-hour) intervals thereafter for light-duty trucks and light heavy-duty engines, or, at 150,000 miles (or 4,500 hours) of use and at 150,000-mile (or 4,500-hours) intervals thereafter for medium and heavy heavy-duty engine:

(A) Turbocharger.

(B) Fuel injectors.

(5) Manufacturers may schedule service to the EGR system at the intervals indicated in paragraph (b) of this section only if a visible signal, approved by the Administrator, alerts the engine operator to the need for EGR maintenance at each of those mileage points.

(6) [Reserved]

(7) *Changes to scheduled maintenance.* (i) For maintenance practices that existed prior to the 1980 model year, only the maintenance items listed in paragraphs (b)(3) and (b)(4) of this section are currently considered by EPA to be emission-related. The Administrator may, however, determine additional scheduled maintenance items that existed prior to the 1980 model year to be emission-related by announcement in a FEDERAL REGISTER Notice. In no event may this notification occur later than September 1 of the calendar year two years prior to the affected model year.

(ii) In the case of any new scheduled maintenance, the manufacturer must submit a request for approval to the Administrator for any maintenance that it wishes to recommend to purchasers and perform during durability determination. New scheduled maintenance is that maintenance which did not exist prior to the 1980 model year, including that which is a direct result of the implementation of new technology not found in production prior to the 1980 model year. The manufacturer must also include its recommendations as to the category (*i.e.*, emission-related or non-emission-related) of the subject maintenance, and, for suggested emission-related maintenance, the maximum feasible maintenance interval. Such requests must include detailed evidence supporting the need for the maintenance requested, and supporting data or other substantiation for the recommended maintenance category and for the interval suggested for emission-related maintenance. Requests for new scheduled maintenance must be approved prior to the introduction of the new maintenance. The Administrator will then designate the maintenance as emission-related or non-emission-related. For each maintenance item designated as emission-related, the Administrator

vill also establish a technologically
iecessary maintenance interval, based
n industry data and any other infor-
nation available to EPA. Designations
f emission-related maintenance items
nd establishment of technologically
iecessary maintenance intervals, will
e announced in the FEDERAL REGIS-
ER.

(iii) Any manufacturer may request
hearing on the Administrator's de-
erminations in paragraph (b)(7) of
his section. The request shall be in
riting, signed by an authorized repre-
entative of the manufacturer, and
hall include a statement specifying
he manufacturer's objections to the
dministrator's determinations, and
ata in support of such objections. If,
fter review of the request and sup-
orting data, the Administrator finds
hat the request raises a substantial
ictual issue, he shall provide the
ianufacturer a hearing in accordance
rith § 86.078-6 with respect to such
sue.

(c) Non-emission-related scheduled
iaintenance which is reasonable and
echnologically necessary (*e.g.*, oil
hange, oil filter change, fuel filter
hange, air filter change, cooling
ystem maintenance, adjustment of
lle speed, governor, engine bolt
orque, valve lash, injector lash,
ming, etc.) may be performed on du-
ibility-data vehicles at the intervals
ecommended by the manufacturer to
e ultimate purchaser.

(d) *Unscheduled maintenance on*
ght-duty durability data vehicles.

(1) Unscheduled maintenance may
e performed during the testing used
determine deterioration factors,
xcept as provided in paragraph (d)(2)
nd (d)(3) of this section, only under
e following provisions:

(i) A fuel injector or spark plug may
e changed if a persistent misfire is
etected.

(ii) Readjustment of a gasoline-
ieled vehicle cold-start enrichment
ystem may be performed if there is a
roblem of stalling.

(iii) Readjustment of the engine idle
eed (curb idle and fast idle) may be
erformed in addition to that per-
rmed as scheduled maintenance
nder paragraph (c) of this section, if
e idle speed exceeds the manufacturer's recommended idle speed by 300 rpm or more, or if there is a problem of stalling.

(2) Any other unscheduled vehicle, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement during testing to determine deterioration factors shall be performed only with the advance approval of the Administrator. Such approval will be given if the Administrator:

(i) Has made a preliminary determination that the part failure or system malfunction, or the repair of such failure or malfunction, does not render the vehicle or engine unrepresentative of vehicles or engines in-use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement; and,

(ii) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, engine stalling, overheating, fluid leakage, loss of oil pressure, excessive fuel consumption or excessive power loss. The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or vehicle/engine malfunction (*e.g.*, misfirng, stalling, black smoke), or an activation of an audible and/or visible signal, prior to the performance of any maintenance to which such overt indication or signal is relevant under the provisions of this section.

(3) Emission measurement may not be used as a means of determining the need for unscheduled maintenance under paragraph (d)(2) of this section, except under the following conditions:

(i) The Administrator may approve unscheduled maintenance on durability-data vehicles based upon a significant change in emission levels that indicates a vehicle or engine malfunction. In these cases the Administrator may first approve specific diagnostic procedures to identify the source of the problem. The Administrator may further approve of specific corrections to the problem after the problem has been identified. The Administrator may only approve the corrective action after it is determined that:

(A) The malfunction was caused by nonproduction build practices or by a previously undetected design problem,

(B) The malfunction will not occur in production vehicles or engines in-use, *and*

(C) The deterioration factor generated by the durability-data vehicle or engine will remain unaffected by the malfunction or by the corrective action (*e.g,* the malfunction was present for only a short period of time before detection, replacement parts are functionally representative of the proper mileage or hours, etc.).

(ii) Following any unscheduled maintenance approved under paragraph (d)(3)(i) of this section, the manufacturer shall perform and after-maintenance emissions test. If the Administrator determines that the after-maintenance emission levels for any pollutant indicates that the deterioration factor is no longer representative of production, the Administrator may disqualify the durability-data vehicle or engine.

(4) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the vehicle/engine unrepresentative of vehicles in-use, the vehicle/engine shall not be used for determining deterioration factors.

(5) Repairs to vehicle components of a durability data vehicle other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(e) *Maintenance on emission data vehicles and engines.* (1) Adjustment of engine idle speed on emission data vehicles may be performed once before the low-mileage/low-hour emission test point. Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on emission data vehicles shall be performed only with the advance approval of the Administrator.

(2) Maintenance on light-duty truck emission-data vehicles selected under § 86.085-24(b)(1) (v) or (viii), and permitted to be tested for purposes of § 86.087-23(c)(1)(i) under the provisions of § 86.085-24(b)(2), may be performed in conjunction with emission control system modifications at the low-mileage test point, and shall be performed in accordance with the maintenance instructions to be provided to the ultimate purchaser required under § 86.087-38.

(3) Maintenance on those light-duty truck emission-data vehicles selected under § 86.085-24(b)(1)(v) which are not capable of being modified in the field for the purpose of complying with emission standards at an altitude other than that intended by the original design, may be performed in conjunction with the emission control system modifications at the low-mileage test point, and shall be approved in advance by the Administrator.

(4) Repairs to vehicle components of an emission data vehicle other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(f) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets and:

(1) Are used in conjunction with scheduled maintenance on such components, or

(2) Are used subsequent to the identification of a vehicle or engine malfunction, as provided in paragraph (d)(2) of this section for durability data vehicles or in paragraph (e)(1) of this section for emission-data vehicles, or

(3) Unless specifically authorized by the Administrator.

(g)(1) Paragraph (g) of this section applies to light-duty vehicles.

(2) *For durability-data vehicles:* (i) Complete emission tests (see §§ 86.106 through 86-145) are required before and after all approved scheduled maintenance which may reasonably be expected to affect emissions. The Administrator may, however, waive these test requirements.

(ii) (A) The manufacturers may optionally perform emission tests before unscheduled maintenance.

(B) Emission tests are required after unscheduled maintenance which may reasonably be expected to affect emissions.

(C) The Administrator may waive the requirement to test after unscheduled maintenance.

(iii) These test data may be submitted weekly to the Administrator, but shall be air posted or delivered within 7 days after completion of the tests, along with a complete record of all pertinent maintenance, including a preliminary engineering report of any malfunction diagnosis and the corrective action taken.

(iv)(A) A complete engineering report shall be delivered to the Administrator with the manufacturer's application for certification, unless requested earlier, in which case it must be delivered within 30 days.

(B) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Administrator in accordance with § 86.087-23.

(h) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Administrator in accordance with § 86.087-23.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10660, Mar. 15, 1985, as amended at 51 FR 24608, July 7, 1986]

§ 86.087-28 Compliance with emission standards.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles.

(2) The applicable exhaust and fuel evaporative emission standards (and family particulate emission limits, as appropriate) of this subpart apply to the emissions of vehicles for their useful life.

(3) Since it is expected that emission control efficiency will change with mileage accumulation on the vehicle, the emission level of a vehicle which has accumulated 50,000 miles will be used as the basis for determining compliance with the standards (or family particulate emission limit, as appropriate).

(4) The procedure for determining compliance of a new motor vehicle with exhaust emission standards (or family particulate emission limit, as appropriate) is as follows, except where specified by paragraph (a)(7) of this section for the Alternative Durability Program:

(i) Separate emission deterioration factors shall be determined from the exhaust emission results of the durability-data vehicle(s) for each engine-system combination. A separate factor shall be established for exhaust HC, exhaust CO, exhaust NO_x, and exhaust particulate (diesel vehicles only) for each engine-system combination. A separate evaporative emission deterioration factor shall be determined for each evaporative emission family-evaporative emission control system combination from the testing conducted by the manufacturer (gasoline-fueled vehicles only).

(A) The applicable results to be used unless excluded by paragraph (a)(4)(i)(A)(*4*) of this section in determining the exhaust emission deterioration factors for each engine-system combination shall be:

(*1*) All valid exhaust emission data from the tests required under § 86.084-26(a)(4) except the zero-mile tests. This shall include the official test results, as determined in § 86.085-29 for all tests conducted on all durability-data vehicles of the combination selected under § 86.085-24(c) (including all vehicles elected to be operated by the manufacturer under § 86.085-24(c)(1)(ii)).

(*2*) All exhaust emission data from the tests conducted before and after the scheduled maintenance provided in § 86.085-25.

(*3*) All exhaust emission data from tests required by maintenance approved under § 86.085-25, in those cases where the Administrator conditioned his approval for the performance of such maintenance on the inclusion of such data in the deterioration factor calculation.

(*4*) The manufacturer has the option of applying an outlier test point procedure to completed durability data within its certification testing program for a given model year. The outlier procedure will be specified by the Administrator. For any pollutant, durability-data test points that are identified as outliers shall not be included in the determination of deterioration factors if the manufacturer has elected this option. The manufacturer shall specify to the Administrator before the certification of the first engine family for that model year, it it intends to use the outlier procedure. The manufacturer may not change procedures after the first engine family of the model year is certified. Where the manufacturer chooses to apply both the outlier procedure and averaging (as allowed under § 86.082-26(b)(8)(ii) to the same data set, the outlier procedure shall be completed prior to applying the averaging procedure.

(B) All applicable exhaust emission results shall be plotted as a function of the mileage on the system, rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The data will be acceptable for use in the calculation of the deterioration factor only if the interpolated 4,000-mile and 50,000-mile points on this line are within the low-altitude standards provided in § 86.085-8 or § 86.085-9, as applicable. Exceptions to this where data are still acceptable are when a best fit straight line crosses an applicable standard but no data points exceeded the standard, or the best fit straight line crosses as applicable standard with a negative slope (the 4,000-mile interpolated point is higher than the 50,000-mile interpolated point) but the 50,000-mile actual data point is below the standard. A multiplicative exhaust emission deterioration factor shall be calculated for each engine-system combination as follows:

Factor=Exhaust emissions interpolated to 50,000 miles divided by exhaust emissions interpolated to 4,000 miles.

These interpolated values shall be carried out to a minimum of four places to the right of the decimal point before dividing one by the other to determine the deterioration factor. The results shall be rounded to three places to the right of the decimal point in accordance with ASTME 29-67.

(C) An evaporative emissions deterioration factor (gasoline-fueled vehicles only) shall be determined from the testing conducted as described in § 86.084-21(b)(4)(i), for each evaporative emission family-evaporative emission control system combination to indicate the evaporative emission level at 50,000 miles relative to the evaporative emission level at 4,000 miles as follows:

Factor=Evaporative emission level at 50,000 miles minus the evaporative emission level at 4,000 miles.

The factor shall be established to a minimum of two places to the right of the decimal.

(ii)(A) The official exhaust emission test results for each emission-data vehicle at the selected test point shall be multiplied by the appropriate deterioration factor: *Provided*, That if a deterioration factor as computed in paragraph (a)(4)(i)(B) of this section is less than one, that deterioration factor shall be one for the purposes of this paragraph.

(B) The official evaporative emission test results (gasoline-fueled vehicles only) for each evaporative emission-data vehicle at the selected test point shall be adjusted by addition of the appropriate deterioration factor: *Provided*, That if a deterioration factor as computed in paragraph (a)(4)(i)(C) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(iii) The emissions to compare with the standard (or the family particulate emission limit, as appropriate) shall be the adjusted emissions of paragraphs (a)(4)(ii) (A) and (B) of this section for each emission-data vehicle. Before any emission value is compared with the standard (or the family particulate emission limit, as appropriate), it shall be rounded, in accordance with ASTME 29-67, to two significant figures. The rounded emission values may not exceed the standard (or the family particulate emission limit, as appropriate).

(iv) Every test vehicle of an engine family must comply with the exhaust emission standards (or the family particulate emission limit, as appropriate), as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(v) Every test vehicle of an evaporative emission family must comply with the evaporative emission standard, as determined in paragraph (a)(4)(iii) of this section before any vehicle in that family may be certified.

(5) If a manufacturer chooses to change the level of any family particulate emission limit(s) in the particulate averaging program, compliance with the new limit(s) must be based upon existing certification data.

(6) If a manufacturer chooses to participate in the diesel particulate averaging program, the production-weighted average of the family particulate emission limits of all affected engine families must comply with the particulate standards in § 86.085-8(a)(1)(iv) or § 86.085-9(a)(1)(iv), as appropriate, at the end of the production year.

(7) The procedure to determine the compliance of new motor vehicles in the Alternative Durability Program (described in § 86.085-13) is the same as described in paragraphs (a)(4)(iii) through (a)(4)(v) of this section. For the engine families that are included in the Alternative Durability Program, the exhaust emission deterioration factors used to determine compliance shall be those that the Administrator has approved under § 86.085-13(c). The evaporative emission deterioration factor for each evaporative emission family shall be determined and applied according to paragraph (a)(4) of this section. The procedures to determine the minimum exhaust emissions deterioration factors required under § 86.085-13(d) are as follows:

(i) Separate deterioration factors shall be determined for the exhaust emission results of the durability-data vehicles for each engine family group. A separate factor shall be established for exhaust HC, exhaust CO, and exhaust NO_x for each engine family group. The evaporative emission deterioration factor for each evaporative family will be determined and applied in accordance with paragraph (a)(4) of this section.

(ii) The deterioration factors for each engine family group shall be determined by the Administrator using historical durability data from as many as three previous model years. These data will consist of deterioration factors generated by durability-data vehicles representing certified engine families and of deterioration factors from vehicles selected under § 86.085-24(h). The Administrator shall determine how these data will be combined for each engine family group.

(A) The test results to be used in the calculation of each deterioration factor to be combined for each engine family group shall be those test results specified in paragraph (a)(4)(i)(A) of this section.

(B) For each durability-data vehicles selected under § 86.085-24(h), all applicable exhaust emissions results shall be plotted as a function of the mileage on the system rounded to the nearest mile, and the best fit straight lines, fitted by method of least squares, shall be drawn through all these data points. The exhaust deterioration factor for each durability-data vehicles shall be calculated as specified in paragraph (a)(4)(i)(B) of this section.

(C) *Line-crossing.* For the purposes of paragraph (a)(5) of this section, line crossing occurs when either of the interpolated 4,000- and 50,000-mile points of the best fit straight line exceeds the applicable emission standard and at least one applicable data point exceeds the standard.

(*1*) The Administrator will not accept for certification line-crossing data from preproduction durability-data vehicles selected under § 86.085-24(c), § 86.085-24(h)(2), or (h)(3).

(*2*) The Administrator will not accept for certification line-crossing data from production durability-data vehicles selected under § 86.085-24(h)(1) unless the 4,000-mile test result multiplied by the engine family group deterioration factor does not exceed the applicable emission standards. The deterioration factors used for this purpose shall be those that were used in the certification of the production vehicle. Manufacturers may calculate this product immediately after the 4,000-mile test of the vehicle. If the product exceeds the applicable standards, the manufacturer may, with the approval of the Administrator, discontinue the vehicle and substitute a new vehicle. The manufacturer may continue the original vehicle, but the data will not be acceptable if line crossing occurs.

(b)(1) Paragraph (b) of this section applies to light-duty trucks.

(2) The exhaust and fuel evaporation emission standards (and the family particulate emission limits, as appropriate) of § 86.085-9 apply to the emissions of vehicles for their useful life.

(3) Since emission control efficiency generally decreases with the accumulation of mileage on the vehicle, deterioration factors will be used in combination with emission-data vehicle test results as the basis for determining compliance with the standards (or the family particulate emission limit, as appropriate).

(4)(i) Paragraph (b)(4) of this section describes the procedure for determining compliance of a new vehicle with exhaust emission standards (or the family particulate emission limit, as appropriate), based on deterioration factors supplied by the manufacturers, except where specified by paragraph (b)(5) of this section for the Alternative Durability Program.

(ii) Separate exhaust emission deterioration factors, determined from tests of vehicles, engines, subsystems, or components conducted by the manufacturer, shall be supplied for each engine-system combination. Separate factors shall be established for transient HC, CO, and NO_x, idle CO (gasoline vehicles only), and exhaust particulate (diesel vehicles only).

(iii) For transient HC, CO, and NO_x, idle CO (gasoline vehicles only), and exhaust particulate (diesel vehicles only), the official exhaust emission results for each emission-data vehicle at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(iv) The emission values to compare with the standards (or family emission limits, as appropriate) shall be the adjusted emission values of paragraph (b)(4)(iii) of this section, rounded to the same number of significant figures as contained in the applicable standard in accordance with ASTM E 29-67, for each emission data engine.

(5)(i) Paragraph (b)(5) of this section applies only to manufacturers which elect to participate in the particulate averaging program.

(ii) If a manufacturer chooses to change the level of any family particulate emission limit(s), compliance with the new limit(s) must be based upon existing certification data.

(iii) The production-weighted average of the family particulate emission limits of all applicable engine families rounded to two significant figures in accordance with ASTME 29-67 must comply with the particulate standards in § 86.085-8(a)(1)(iv) or § 86.085-9(a)(1)(iv), as appropriate, at the end of the product year.

(6) The procedure to determine the compliance of new motor vehicles in the Alternative Durability Program (described in § 86.085-13) is the same as described in paragraphs (b)(4)(iv), (b)(7)(iv) and (b)(8) of this section. For the engine families that are included in the Alternative Durability Program, the exhaust emission deterioration factors used to determine compliance shall be those that the Administrator has approved under § 86.085-13(c). The evaporative emission deterioration factor for each evaporative emission family shall be determined and applied according to paragraph (b)(7) of this section. The procedures to determine the minimum exhaust emissions deterioration factors required under § 86.085-13(d) are as follows:

(i) Separate deterioration factors shall be determined from the exhaust emission results of the durability-data vehicles for each engine family group. A separate factor shall be established for exhaust HC, exhaust CO, and exhaust NO_x for each engine family group. The evaporative emission deterioration factor for each evaporative family will be determined and applied in accordance with paragraph (b)(6) of this section.

(ii) The deterioration factors for each engine family group shall be determined by the Administrator using historical durability data from as many as three previous model years. These data will consist of deterioration factors generated by durability-data vehicles representing certified engine families and of deterioration factors from vehicles selected under § 86.085-24(h). The Administrator shall determine how these data will be combined for each engine family group.

(A) The test results to be used in the calculations of each deterioration factor to be combined for each engine family group shall be those test results specified in paragraph a)(4)(i)(A) of this section.

(B) For each durability-data vehicle elected under § 86.085-24(h), all applicable exhaust emission results shall be plotted as a function of the mileage on he system rounded to the nearest nile, and the best fit straight lines, itted by the method of least squares, hall be drawn through all these data points. The exhaust deterioration actor for each durability-data vehicle hall be calculated as specified in paragraph (a)(4)(i)(B) of this section.

(C) *Line crossing*. For the purposes f paragraph (b)(5) of this section, line rossing occurs when either of the inerpolated 4,000- and 120,000-mile oints of the best fit straight line xceed the applicable emission standrd and at least one applicable data oint exceeds the standard.

(*1*) The Administrator will not ccept for certification line-crossing ata from preproduction durability-ata vehicles selected under § 86.085-4(c)(1), or § 86.085-24(h)(2) or (h)(3).

(*2*) The Administrator will not ccept for certification line-crossing ata from production durability-data ehicles selected under § 86.085-4(h)(1) unless the 4,000-mile test esult multiplied by the engine family roup deterioration factor does not xceed the applicable emission standrd. The deterioration factors used for his purpose shall be those that were sed in the certification of the producon vehicle. Manufacturers may calcuate this product immediately after he 4,000-mile test of the vehicle. If he product exceeds the applicable andard, the manufacturer may, with he approval of the Administrator, disontinue the vehicle and substitute a ew vehicle. The manufacturer may ontinue the original vehicle, but the data will not be acceptable if line crossing occurs.

(7)(i) Paragraph (b)(7) of this section describes the procedure for determining compliance of a new vehicle with fuel evaporative emission standards. The procedure described here shall be used for all vehicles in all model years.

(ii) The manufacturer shall determine, based on testing described in § 86.085-21(b)(4)(i), and supply an evaporative emission deterioration factor for each evaporative emission family-evaporative emission control system combination. The factor shall be calculated by subtracting the emission level at the selected test point from the emission level at the useful life point.

(iii) The official evaporative emission test results for each evaporative emission-data vehicle at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission value to compare with the standards shall be the adjusted emission value of paragraph (b)(7)(iii) of this section rounded to two significant figures in accordance with ASTM E 29-67 for each evaporative emission-data vehicle.

(8) Every test vehicle of an engine family must comply with all applicable standards (and the family particulate emissions limits, as appropriate), as determined in paragraphs (b)(4)(iv) and (b)(7)(iv) of this section, before any vehicle in that family will be certified.

(c)(1) Paragraph (c) of this section applies to heavy-duty engines.

(2) The exhaust emission standards for gasoline-fueled engines in § 86.087-10 of for diesel engines in § 86.085-11 apply to the emissions of engines for their useful life.

(3) Since emission control efficiency generally decreases with the accumulation of service on the engine, deterioration factors will be used in combination with emission-data engine test results as the basis for determining compliance with the standards.

(4)(i) Paragraph (c)(4) of this section describes the procedure for determining compliance of an engine with emission standards, based on deterioration factors supplied by the manufacturer.

(ii) Separate exhaust emission deterioration factors, determined from tests of engines, subsystems, or components conducted by the manufacturer, shall be supplied for each engine-system combination. For gasoline and diesel engines, separate factors shall be established for transient HC, CO, and NO_x. For diesel smoke testing, separate factors shall also be established for the acceleration mode (designated as "A"), the lugging mode (designated as "B"), and peak opacity (designated as "C").

(iii) (A) Paragraph (c)(4)(iii)(A) of this section applies to gasoline-fueled heavy-duty engines.

(*1*) *Gasoline-fueled heavy-duty engines not utilizing aftertreatment technology (e.g., catalytic converters).* For transient HC, CO, and NO_x, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(*2*) *Gasoline-fueled heavy-duty engines utilizing aftertreatment technology (e.g., catalytic converters).* For transient HC, CO, NO_x, and for idle CO, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(B) Paragraph (c)(4)(iii)(B) of this section applies to diesel heavy-duty engines.

(*1*) *Diesel heavy-duty engines not utilizing aftertreatment technology (e.g., particulate traps).* For transient HC, CO, and NO_x, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(*2*) *Diesel heavy-duty engines utilizing aftertreatment technology (e.g., particulate traps.)* For transient HC, CO, and NO_x, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(*3*) For acceleration smoke ("A"), lugging smoke ("B"), and peak smoke ("C"), the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission values to compare with the standards (or family emission limits, as appropriate) shall be the adjusted emission values of paragraph (c)(4)(iii) of this section, rounded to the same number of significant figures as contained in the applicable standard in accordance with ASTM E 29-67, for each emission-data engine.

(5)—(6) [Reserved]

(7) Every test engine of an engine family must comply with all applicable standards, as determined in paragraph (c)(4)(iv) of this section, before any engine in that family will be certified.

(d)(1) Paragraph (d) of this section applies to gasoline-fueled heavy-duty vehicles.

(2) The applicable fuel evaporative emission standard in § 86.085-10 applies to the emissions of vehicles for their useful life.

(3)(i) For vehicles with a GVWR of up to 26,000 pounds, because it is expected that emission control efficiency will change during the useful life of the vehicle, an evaporative emission deterioration factor shall be determined from the testing described in § 86.085-23(b)(3) for each evaporative emission family-evaporative emission control system combination to indicate the evaporative emission control system deterioration during the useful fe of the vehicle (minimum 50,000 iles). The factor shall be established) a minimum of two places to the ght of the decimal.

(ii) For vehicles with a GVWR of reater than 26,000 pounds, because it expected that emission control efficiency will change during the useful fe of the vehicle, each manufactur-'s statement as required in § 86.085-(b)(4)(ii) shall include, in accordance ith good engineering practice, consid-ation of control system deteriora-on.

(4) The evaporative emission tests sults, if any, shall be adjusted by the ldition of the appropriate deteriora-on factor: *Provided,* That if the dete-oration factor as computed in para-aph (d)(3) of this section is less than ro, that deterioration factor shall be ro for the purposes of this para-aph.

(5) The emission level to compare th the standard shall be the adjust- emission level of paragraph (d)(4) this section. Before any emission lue is compared with the standard, shall be rounded, in accordance with STME 29-67, to two significant fig-es. The rounded emission values ay not exceed the standard.

(6) Every test vehicle of an evapora-e emission family must comply with e evaporative emission standard, as termined in paragraph (d)(5) of this ction, before any vehicle in that mily may be certified.

pproved by the Office of Management d Budget under control number 2000-90)

FR 52196, Nov. 16, 1983, as amended at FR 48137, Dec. 10, 1984; 50 FR 10665, ar. 15, 1985; 51 FR 24609, July 7, 1986]

6.087-29 Testing by the Administrator.

a)(1) Paragraph (a) of this section plies to light-duty vehicles and ht-duty trucks.

2) The Administrator may require at any one or more of the test vehi-s be submitted to him, at such place places as he may designate, for the rposes of conducting emissions ts. The Administrator may specify at he will conduct such testing at e manufacturer's facility, in which se instrumentation and equipment ecified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test vehicle, the results of that test shall, unless subsequently invalidated by the Administrator, comprise the official data for the vehicle at the prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards (or the family particulate emission limit, as appropriate).

(ii) Whenever the Administrator does not conduct a test on a test vehicle at a test point, the manufacturer's test data will be accepted as the offical data for that point: *Provided,* That if the Administrator makes a determination based on testing under paragraph (a)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *And further provided,* That if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provisions of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission or further information. If the manufacturer conducts more than one test on a vehicle, as authorized under § 86.084-26 (a)(3)(i)(A) or (b)(4)(i)(A), the data from the last test in that series of tests on that vehicle, will constitute the official data.

(iii)(A)(*1*) The Administrator may adjust or cause to be adjusted any adjustable parameter of an emission data vehicle or engine which the Administrator has determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.085-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.086-22(e)(3)(i), prior to the performance of any tests to determine whether such vehicle or engine conforms to applicable emission standards, including tests performed by the manufacturer under § 86.087-23(c)(1). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before it accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. The Administrator, in making or specifying such adjustments, will consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use light-duty vehicles or light-duty trucks. In determining likelihood, the Administrator will consider factors such as, but not limited to, the effect of the adjustment on vehicle performance characteristics and surveillance information from similar in-use vehicles.

(*2*) For those vehicles or engine parameters which the Administrator has not determined to be subject to adjustment during certification and Selective Enforcement Audit testing in accordance with § 86.087-22(3)(1), the emission-data vehicle presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the vehicle label (see § 86.087-35(a)(1)(iii)(D) or (a)(2)(iii)(D)) as specified in the application for certification. If the Administrator determines that a vehicle is not within such tolerances, the vehicle will be adjusted, at the facility designated by the Administrator, prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the vehicle will be used as an emission-data vehicle.

(B) If the Administrator determines that the test data developed on an emission-data vehicle under paragraph (a)(3)(i) of this section would cause that vehicle to fail due to excessive 4,000-mile emissions or by application of the appropriate deterioration factor, then the following procedure shall be observed:

(*1*) The manufacturer may request a retest. Before the retest, those vehicle or engine parameters which the Administrator has not determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.085-22(e)(1) may be readjusted to manufacturer's specification, if these adjustments were made incorrectly prior to the first test. The Administrator may adjust or cause to be adjusted any parameter which the Administrator has determined to be subject to adjustment to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.085-22(e)(3)(i). Other maintenance or repairs may be performed in accordance with § 86.084-25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The vehicle will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data vehicle.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (a)(2) of this section to enable the Administrator to determine whether an emission-data vehicle would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (a)(3)(iii) (A) and (B) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the vehicle from the test premises.

(b)(1) Paragraph (b) of this section applies to heavy-duty engines.

(2) The Administrator may require that any one or more of the test engines be submitted to him, at such place or places as he may designate,

for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test engine the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the engine at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on a test engine at a test point, the manufacturer's test data will be accepted as the official data for that test point: *Provided,* That if the Administrator makes a determination based on testing under paragraph (b)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer: *And further provided,* That if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission of further information.

(iii)(A)(*1*) The Administratior may adjust or cause to be adjusted any adjustable parameter of an emission-data engine which the Administrator has determined to be subject to adjustment for certification testing in accordance with § 86.085-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.085-22(e)(3)(i), prior to the performance of any tests to determine whether such engine conforms to applicable emmission standards, including tests performed by the manufacturer under § 86.087-23(c)(2). The Administrator, in making or specifying such adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use heavy-duty engines. In determining likelihood, the Administrator may consider factors such as, but not limited to, the effect of the adjustment on engine performance characteristics and surveillance information from similar in-use engines.

(*2*) For those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.085-22(e)(1), the emission-data engine presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the engine label (see § 86.087-35(a)(3)(iii)) as specified in the application for certification. If the Administrator determines that an engine is not within such tolerances, the engine shall be adjusted at the facility designated by the Administrator prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the engine shall be used as an emission-data engine.

(B) If the Administrator determines that the test data developed under paragraph (b)(3)(iii)(A) of this section would cause the emission-data engine to fail due to excessive 125-hour emission values or by the application of the appropriate deterioration factor, then the following procedure shall be observed:

(*1*) The manufacturer may request a retest. Before the retest, those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.085-22(e)(1) may be readjusted to the manufacturer's specifications, if these adjustments were made incorrectly prior to the first test. The Administrator may adjust or cause to be adjusted any parameter which the Administrator has determined to be subject to adjustment in accordance with § 86.085-22(e)(3)(i). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before it accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. Other maintenance or repairs may be performed in accordance with § 86.084-25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The engine will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data engine.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (b)(2) of this section to enable the Administrator to determine whether an emission-data engine would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (b)(3)(iii)(B) (*1*) and (*2*) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the engine from the test premises.

(c)(1) Paragraph (c) of this section applies to gasoline-fueled heavy-duty vehicles.

(2) The Administrator may require that any one or more of the evaporative emission family-system combinations included in the manufacturer's statement(s) of compliance be installed on an appropriate vehicle and such vehicle be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on an evaporative emission family-system combination the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the evaporative emission family-system combination and the manufacturer's data, analyses, etc., shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on an evaporative emission family-system combination, the manufacturer's test data will be accepted as the offical data: *Provided*, That if the Administrator makes a determination based on testing under paragraph (c)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer: *And further provided*, That if the Administrator has reasonable basis to believe that any test data, analyses, or other information submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the administrator may refuse to accept those data, analyses, etc., as the official data pending retesting or submission of further information.

[49 FR 3024, Jan. 24, 1984]

§ 86.087–30 Certification.

(a)(1)(i) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 86.078-7(c), and any other pertinent data or information, the administrator determines that a test vehicle(s) (or test engine(s)) meet(s) the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such vehicles(s) (or engine(s)) except in cases covered by paragraphs (a)(1)(ii) and (c) of this section.

(ii) *Gasoline-fueled heavy-duty vehicles.* If, after a review of the statement(s) of compliance submitted by the manufacturer under § 86.087-23(b)(4) and any other pertinent data or information, the Administrator deermines that the requirements of the Act and this subpart have been met, he will issue one certificate of conormity per manufacturer with respect o the evaporative emission family(s) overed by such statement(s) except in ases covered by paragraph (c) of this ection.

(2) Such certificate will be issued for uch period not to exceed one model ear as the Administrator may determine and upon such terms as he may eem necessary or appropriate to ssure that any new motor vehicle (or ew motor vehicle engine) covered by he certificate will meet the requirements of the Act and of this part.

(3)(i) One such certificate will be sued for each engine family. For gasline-fueled light-duty vehicles and ght-duty trucks, one such certificate ill be issued for each engine family-vaporative emission family combinaon.

(A) *Light-duty vehicles.* Each certifiate will certify compliance with no ore than one set of standards (or one mily particulate emission limit, as ppropriate).

(B) *Light-duty trucks.* Each certifite will certify compliance with no ore than one set of standards (or one mily particulate emission limit, as ppropriate) except for low-altitude andards and high-altitude standards. he certificate shall state that it vers vehicles sold or delivered to an timate purchaser for principal use at designated high-altitude location ly if the vehicle conforms in all marial respects to the design specificaons that apply to those vehicles deribed in the application for certificaon at high altitude.

ii) For gasoline-fueled heavy-duty hicles, one such certificate will be ued for each manufacturer and will rtify compliance for those vehicles previously identified in that manufacturer's statement(s) of compliance as required in § 86.087-23(b)(4) (i) and (ii).

(iii) For diesel light-duty vehicles and light-duty trucks included in the particulate averaging program, the manufacturer may at any time during production elect to change the level of any family particulate emission limit by demonstrating compliance with the new limit as described in §§ 86.087-28(a)(6) and 86.087-28(b)(7). New certificates issued under this paragraph will be applicable only for vehicles produced subsequent to the date of issuance.

(4)(i) The adjustment or modification or any light-duty truck in accordance with instructions provided by the manufacturer for the altitude where the vehicle is principally used will not be considered a violation of section 203(a)(3) of the Clean Air Act.

(ii) A violation of section 203(a)(1) of the Clean Air Act occurs when a manufacturer sells or delivers to an ultimate purchaser any light-duty vehicle or light-duty truck, subject to the regulations under the Act, under any of the conditions specified in the remainder of this paragraph.

(A) When a light-duty vehicle or light-duty truck is not configured to meet high-altitude requirements;

(*1*) At a designated high-altitude location, unless such manufacturer has reason to believe that such vehicle will not be sold to an ultimate purchaser for principal use at a designated high-altitude location; or

(*2*) At a location other than a designated high-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated high-altitude location.

(B) When a light-duty vehicle is not configured to meet low-altitude requirements, as provided in § 86.085-8(i):

(*1*) At a designated high-altitude location, unless such manufacturer has reason to believe that such vehicle will not be sold to an ultimate purchaser for principal use at a designated low-altitude location; or

(*2*) At a location other than a designated low-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated low-altitude location.

(iii) A manufacturer shall be deemed to have reason to believe that a light-duty vehicle that has been exempted from compliance with emission standards at high-altitude, or a light-duty truck which is not configured to meet high-altitude requirements, will not be sold to an ultimate purchaser for principal use at a designated high-altitude location if the manufacturer has informed its dealers and field representatives about the terms of these high-altitude regulations, has not caused the improper sale itself, and has taken reasonable action which shall include, but not be limited to, either paragraph (a)(4)(iii) (A) or (B), and (C) of this section:

(A) Requiring dealers in designated high-altitude locations to submit written statements to the manufacturer signed by the ultimate purchaser that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location; requiring dealers in counties contiguous to designated high-altitude locations to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location; and for each sale or delivery of fleets of ten or more such vehicles in a high-altitude location or in counties contiguous to high-altitude locations, requiring either the selling dealer or the delivering dealer to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location. In addition, the manufacturer will make available to EPA, upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold) sales, warranty, or other information pertaining to sales of vehicles by the dealers described above maintained by the manufacturer in the normal course of business relating to the altitude configurartion of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of low-altitude vehicles by high-altitude dealers, or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser for principal use at a designated high-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a State or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser residing in a designated high-altitude location, or based on information obtained pursuant to paragraph (a)(4)(iii) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and, where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet high-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(iv) A manufacturer shall be deemed to have reason to believe that a light-duty vehicle which has been exempted from compliance with emission stand-

ards at low-altitude, as provided in
§ 86.084-8(i), will not be sold to an ulti-
mate purchaser for principal use at a
designated low-altitude location if the
manufacturer has informed its dealers
and field representatives about the
terms of these high-altitude regula-
tions, has not caused the improper
sale itself, and has taken reasonable
action which shall include, but not be
limited to, either paragraph (a)(4)(iv)
A) or (B), and (C) of this section:

(A) Requiring dealers in designated
ow-altitude locations to summit writ-
ten statements to the manufacturer
signed by the ultimate purchaser that
a vehicle which is not configured to
meet low-altitude requirements will
not be used principally at a designated
ow-altitude location; requiring dealers
n counties contiguous to designated
ow-altitude locations to submit writ-
en statements to the manfacturer,
signed by the ultimate purchaser who
epresents to the dealer in the normal
course of business that he or she re-
sides in a designated low-altitude loca-
ion, that a vehicle which is not con-
igured to meet low-altitude require-
nents will not be used principally at a
lesignated low-altitude location; and
or each sale or delivery of fleets of
en or more such vehicles in a low-alti-
ude location or in counties contiguous
o low-altitude locations, requiring
ither the selling dealer or the deliver-
ng dealer to submit written state-
nents to the manufacturer, signed by
he ultimate purchaser who represents
o the dealer in the normal course of
usiness that he or she resides in a
lesignated low-altitude location, that
vehicle which is not configured to
neet low-altitude requirements will
ot be used principally at a designated
igh-altitude location. In addition, the
nanufacturer will make available to
PA, upon reasonable written request
but not more frequently than quar-
erly, unless EPA has demonstrated
hat it has substantial reason to be-
ieve that an improperly configured
ehicle has been sold), sales, warranty,
r other information pertaining to
ales of vehicles by the dealers de-
cribed above maintained by the man-
facturer in the normal course of busi-
ess relating to the altitude configuration of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of high-altitude vehicles by low-altitude dealers or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the low-altitude requirements to an ultimate purchaser for principal use at a designated low-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a state or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the low-altitude requirements to an ultimate purchaser residing in a designated low-altitude location, or based on information obtained pursuant to paragraph (a)(4)(iv) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and, where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet low-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(5)(i) For the purpose of paragraph (a) of this section, a "designated high-altitude location" is any county which has substantially all of its area located above 1,219 meters (4,000 feet) and:

(A) Requested an extension past the attainment date of December 31, 1982, for compliance with either the National Ambient Air Quality Standards for carbon monoxide or ozone, as indicated in Part 52 (Approval and Promulgation of Implementation Plans) of this title; or

(B) Is in the same state as a county designated as a high-altitude location according to paragraph (a)(5)(i)(A) of this section.

(ii) The designated high-altitude locations defined in paragraph (a)(5)(i) of this section are listed below:

STATE OF COLORADO

Adams
Alamosa
Arapahoe
Archuleta
Boulder
Chaffee
Cheyenne
Clear Creek
Connejos
Costilla
Crowley
Custer
Delta
Denver
Dolores
Douglas
Eagle
Elbert
El Paso
Fremont
Garfield
Gilpin
Grand
Gunnison
Hinsdale
Huerfano
Jackson
Jefferson
Kit Carson
Lake
La Plata
Larimer
Las Animas
Lincoln
Mesa
Mineral
Moffat
Montezuma
Montrose
Morgan
Otero
Ouray
Park
Pitkin
Pueblo
Rio Blanco
Rio Grande
Routt
Saguache
San Juan
San Miguel
Summit
Teller
Washington
Weld

STATE OF NEVADA

Carson City
Douglas
Elko
Esmeralda
Eureka
Humboldt
Lander
Lincoln
Lyon
Mineral
Nye
Pershing
Storey
Washoe
White Pine

STATE OF NEW MEXICO

Bernalillo
Catron
Colfax
Curry
De Baca
Grant
Guadalupe
Harding
Hidalgo
Lincoln
Los Alamos
Luna
McKinley
Mora
Otero
Rio Arriba
Roosevelt
Sandoval
San Juan
San Miguel
Santa Fe
Sierra
Socorro
Taos
Torrance
Union
Valencia

STATE OF UTAH

Beaver
Box Elder
Cache
Carbon
Daggett
Davis
Duchesne
Emery
Garfield
Grand
Iron
Juab
Kane
Millard
Morgan
Piute
Rich
Salt Lake
San Juan
Sanpete
Sevier
Summit
Tooele
Uintah
Utah
Wasatch
Wayne
Weber

(iii) For the purpose of paragraph (a) of this section, a "designated low-altitude location" is any county which has substantially all of its area located below 1,219 meters (4,000 feet).

(iv) The designated low-altitude locations so defined include all counties in the United States which are not listed in either paragraph (a)(5)(ii) of this section or in the list below:

STATE OF ARIZONA

Apache
Cochise
Coconino
Navajo
Yavapai

STATE OF IDAHO

Bannock
Bear Lake
Bingham
Blaine
Bonneville
Butte
Camas
Caribou
Cassia
Clark
Custer
Franklin
Fremont
Jefferson
Lemhi
Madison
Minidoka
Oneida
Power
Tenton
Valley

STATE OF MONTANA

Beaverhead
Deer Lodge
Gallatin
Jefferson
Judith Basin
Madison
Meagher
Park
Powell
Silver Bow
Wheatland

STATE OF NEBRASKA

Banner
Cheyenne
Kimball
Sioux

STATE OF OREGON

Harney
Klamath
Lake

STATE OF TEXAS

Jeff Davis
Hudspeth
Parmer

STATE OF WYOMING

Albany
Campbell
Carbon
Converse

Fremont
Goshen
Hot Springs
Johnson
Laramie
Lincoln
Natrona
Niobrara
Park
Platte
Sublette
Sweetwater
Teton
Uinta
Washakie
Weston

(6) Catalyst-equipped vehicles, otherwise covered by a certificate, which are driven outside the United States, Canada, and Mexico will be presumed to have been operated on leaded gasoline resulting in deactivation of the catalysts. If these vehicles are imported or offered for importation without etrofit of the catalyst, they will be onsidered not to be within the coverge of the certificate unless included n a catalyst control program operated y a manufacturer or a United States Government agency and approved by he Administrator.

(7) For incomplete light-duty trucks, certificate covers only those new notor vehicle which, when completed y having a primary load-carrying levice or container attached, conform o the maximum curb weight and rontal area limitations described in he application for certification as re-uired in §86.087-21(d).

(8) For heavy-duty engines, a certifi-ate covers only those new motor vehi-le engines installed in heavy-duty ve-icles which conform to the minimum ross vehicle weight rating, curb veight, or frontal area limitations for eavy-duty vehicles described in 86.082-2.

(9) For incomplete gasoline-fueled eavy-duty vehicles a certificate overs only those new motor vehicles vhich, when completed, conform to he nominal maximum fuel tank ca-acity limitations as described in the pplication for certification as re-uired in § 86.087-21(e).

(10) For diesel light-duty vehicles nd diesel light-duty truck families vhich participate in a particulate veraging program, the manufactur-r's production weighted average of he particulate emission limits of all ngine families in a participating class r classes shall not exceed the applica-le diesel particulate standard, or com-osite standard, as appropriate, at the nd of the model year, as determined n accordance with 40 CFR Part 86. The certificate shall be void *ab initio* for those vehicles causing any exceedance of the particulate standard.

(b)(1) The Administrator will determine whether a vehicle (or engine) covered by the application complies with applicable standards (or family particulate emission limit, as appropriate) by observing the following relationships:

(i) *Light-duty vehicles.* (A) The durability-data vehicle(s) selected under § 86.085-24(c)(1)(i) shall represent all vehicles of the same engine-system combination.

(B) The emission-data vehicle(s) selected under § 86.085-24(b)(1) (ii) through (iv) shall represent all vehicles of the same engine-system combination as applicable.

(C) The emission-data vehicle(s) selected under § 86.085-24(b)(1)(vii) (A) and (B) shall represent all vehicles of the same evaporative control system within the evaporative family.

(ii) *Light-duty trucks.* (A) The emission-data vehicle(s) selected under § 86.085-24(b)(1)(ii), shall represent all vehicles of the same engine-system combination as applicable.

(B) The emission-data vehicle(s) selected under § 86.085-24(b)(1)(vii) (A) and (B) shall represent all vehicles of the same evaporative control system within the evaporative family.

(C) The emission-data vehicle(s) selected under § 86.085-24(b)(1)(v) shall represent all vehicles of the same engine-system combination as applicable.

(D) The emission-data vehicle(s) selected under § 86.085-24(b)(1)(viii) shall represent all vehicles of the same evaporative control system within the evaporative emission family, as applicable.

(iii) *Heavy-duty engines.* (A) A gasoline-fueled emission-data test engine selected under § 86.085-24(b)(2)(iv) shall represent all engines in the same family of the same engine displacement-exhaust emission control system combination.

(B) A gasoline-fueled emission-data test engine selected under § 86.085-24(b)(2)(iii) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(C) A diesel emission-data test engine selected under § 86.085-24(b)(3)(ii) shall represent all engines in the same engine-system combination.

(D) A diesel emission-data test engine selected under § 86.085-24(b)(3)(iii) shall represent all engines of that emission control system at the rated fuel delivery of the test engine.

(iv) *Gasoline-fueled heavy-duty vehicles.* A statement of compliance submitted under § 86.087-23(b)(4)(i) or (ii) shall represent all vehicles in the same evaporative emission family-evaporative emission control system combination.

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the vehicles (or engines) belonging to an engine family or engine family-evaporative emission family combination (as applicable), all of which comply with all applicable standards (or the family emission limit, as appropriate).

(3) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to §86.087-29, data or information derived from any inspection carried out under § 86.078-7(c) or any other pertinent data or information, the Administrator determines that one or more test vehicles (or test engines) of the certification test fleet do not meet applicable standards (or family particulate emission limits, as appropriate), he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determination and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078-6 with respect to such issue.

(4) For light-duty vehicles and light-duty trucks the manufacturer may, at its option, proceed with any of the following alternatives with respect to an emission-data vehicle determined not in compliance with all applicable standards (or the family particulate emission limit, as appropriate) for which it was tested:

(i) Request a hearing under § 86.078-6; or

(ii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed, from his application;

(A) If the failed vehicle was tested for compliance with exhaust emission standards (or the family particulate emission limit, as appropriate) only: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle to be tested for exhaust emission compliance only.

(B) If the failed vehicle was tested for compliance with both exhaust and evaporative emission standards: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle which will be tested for compliance with both exhaust and evaporative emission standards. If one vehicle cannot be selected in accordance with the selection criteria employed in selecting the failed vehicle then two vehicles may be selected (i.e. one vehicle to satisfy the exhaust emission vehicle selection criteria and one vehicle to satisfy the evaporative emission vehicle selection criteria). The vehicle selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards only. The vehicle selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards; or

(iii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed from the application and add a vehicle configuration(s) (or evaporative vehicle configuration(s), as applicable) not previously listed. The Administrator may require, if applicable, that the failed vehicle be modified to the new engine code (or evaporative emission code, as applicable) and demonstrate by testing that it meets applicable standards (or the family particulate emission limit, as appropriate) for which it was originally tested. In addition, the Administrator may select, in accordance with the vehicle selection criteria given in § 86.084-24(b), a new emission-data vehicle or vehicles. The vehicles selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards (or the family particulate emission limit, as appropriate) only. The vehicles selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards (or the family particulate emission limit, as appropriate); or

(iv) Correct a component or system malfunction and show that with a correctly functioning system or component the failed vehicle meets applicable standards (or the family particulate emission limit, as appropriate) for which it was originally tested. The Administrator may require a new emission-data vehicle, of identical vehicle configuration (or evaporative vehicle configuration, as applicable) to the failed vehicle, to be operated and tested for compliance with the applicable standards (or the family particulate emission limit, as appropriate) for which the failed vehicle was originally tested.

(5) For heavy-duty engines the manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test engine(s) determined not in compliance with applicable standards:

(i) Request a hearing under § 86.078-6; or

(ii) Delete from the application for certification the engines represented by the failing test engine. (Engines so deleted may be included in a later request for certification under 86.079-32.) The Administrator may then select in place of each failing engine an alternate engine chosen in accordance with selection criteria employed in selecting the engine that failed; or

(iii) Modify the test engine and demonstrate by testing that it meets applicable standards. Another engine which is in all material respects the same as the first engine, as modified, may then be operated and tested in accordance with applicable test procedures.

(6) If the manufacturer does not request a hearing or present the required data under paragraph (b) (4) or (5) of this section (as applicable), the Administrator will deny certification.

(c)(1) Notwithstanding the fact that any certification vehicle(s) (or certification engine(s)) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such vehicle(s) (or engine(s)) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof;

(ii) The manufacturer renders inaccurate any test data which he submits pertaining thereto or otherwise circumvents the intent of the Act, or of this part with respect to such vehicle (or engine);

(iii) Any EPA Enforcement Officer is denied access on the terms specified in § 86.078-7(c) to any facility or portion thereof which contains any of the following:

(A) The vehicle (or engine);

(B) Any components used or considered for use in its modification or buildup into a certification vehicle (or certification engine);

(C) Any production vehicle (or production engine) which is or will be claimed by the manufacturer to be covered by the certificate;

(D) Any step in the construction of a vehicle (or engine) described in paragraph (c)(1)(iii)(C) of this section;

(E) Any records, documents, reports, or histories required by this part to be kept concerning any of the above;

(iv) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 86.078-7(c)) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(2) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraph (c)(1) (i), (ii), (iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void ab initio.

(4) In any case in which certification of a vehicle (or engine) is proposed to be withheld, denied, revoked, or suspended under pargraph (c)(1) (iii) or (iv) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.078-7(c) in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle (or engine) in question was not involved in the violation to a degree that would warrant withholding denial, revocation, or suspension of certification under either paragraph (c)(1)(iii) or (iv) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(5) Any revocation or suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.078-6 hereof.

(ii) Extend no further than to forbid the introduction into commerce of vehicles (or engines) previously covered by the certification which are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes the certification invalid ab initio.

(6) The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Administrator under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with § 86.078-6. If the Administrator finds, after a review of the request and supporting data, that the request raises a substantial factual issue, he will grant the request with respect to such issue.

(d)(1) *For light-duty vehicles.* Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.603; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.603; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.609; or

(iv) The manufacturer renders inaccurate any test data which he submits pursuant to § 86.609; or

(v) Any EPA Enforcement Officer is denied access to a facility on the terms specified in § 86.606; or

(vi) Any EPA Enforcement Officer is denied the opportunity on the terms specified in § 86.606, to:

(A) Monitor vehicle selection pursuant to § 86.607, or

(B) Select vehicles for testing pursuant to § 86.607, or

(C) Monitor vehicle testing performed to satisfy any of the requirements of this part; or

(vii) Any EPA Enforcement Officer is denied "reasonable assistance" as defined in § 86.606 in examining any of the items listed in that section; or

(viii) The manufacturer refuses to comply with the requirements of §§ 86.604(a), 86.605, and 86.607, 86.608, 86.610, or § 86.611.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraph (d)(1) (i), (ii), or (viii) of this section where such refusal is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but not be limit-

ed to, any uncontrollable factors which results in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturer to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanctions of suspending a certificate may be imposed for the reasons in paragraph (d)(1) (iii), (iv), (v), (vi), or (vii) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate or conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a vehicle is proposed to be suspended under paragraph (d)(1) (v), (vi), or (vii) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.606 in fact occurred, the manufacturer, if he wishes to contend that even though the violation occurred, the vehicle configuration or engine family in question was not involved in the violation to the degree that would warrant suspension of certification under either paragraph (d)(1) (v), (vi), or (vii) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (d)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.613 hereof, and

(ii) Not apply to vehicles no longer in the hands of the manufacurer.

(e) For light-duty trucks, heavy-duty engines, and heavy-duty vehicles. (1) Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle or engine configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.1003; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.1003; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.1009 or § 86.1112-87; or

(iv) The manufacturer renders inaccurate any test data submitted pursuant to § 86.1009 or § 86.1112-87; or

(v) Any EPA Enforcement Officer is denied the opportunity to conduct activities related to entry and access as authorized in § 86.1006 or § 86.1109-87 and in a warrant or court order presented to the manufacturer or the party in charge of the facility in question; or

(vi) EPA Enforcement Officers are unable to conduct activities related to entry and access as authorized in § 86.1006 or § 86.1109-87 because a manufacturer has located a facility in a foreign jurisdiction where local law prohibits those activities; or

(vii) The manufacturer refuses to or in fact does not comply with the requirements of §§ 86.1004(a), 86.1005, 86.1007, 86.1008, 86.1010, 86.1011, 86.1013, 86.1107(a), 86.1108-87, 86.1110-87, 86.1111-87, 86.1112-87 or § 86.1113-87.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraph (e)(1) (i), (ii), or (vii) of this section where such refusal or denial is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but are not limited to, any uncontrollable factors

which result in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturers to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanction of suspending a certificate may be imposed for the reasons outlined in paragraph (e)(1) (iii), (iv), or (v) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a light-duty truck, heavy-duty engine, or heavy-duty vehicle is proposed to be suspended under paragraph (e)(1)(v) of this section and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.1006 or § 86.1109-87 in fact occurred, if the manufacturer wishes to contend that, although the violation occurred, the vehicle or engine configuration or engine family in question was not involved in the violation to a degree that would warrant suspension of certification under paragraph (e)(1)(v) of this section, he shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (e)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014 or § 86.1115-87, and

(ii) Not apply to vehicles or engines no longer in the hands of the manufacturer.

(7) Any voiding of a certificate of conformity under paragraph (e)(4) of this section shall be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014 or § 86.1115-87.

[49 FR 3026, Jan. 24, 1984, as amended at 50 FR 35386, Aug. 30, 1985]

§ 86.087-35 Labeling.

(a) The manufacturer of any motor vehicle (or motor vehicle engine) subject to the applicable emission standards (and family particulate emission limits, as appropriate) of this subpart, shall, at the time of manufacture, affix a permanent legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles (or engines) available for sale to the public and covered by a certificate of conformity under § 86.084-30(a).

(1) *Light-duty vehicles.* (i) A permanent, legible label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches), engine, family identification and evaporative family identification;

(D) Engine tune-up specifications and adjustments, as recommended by the manufacturer in accordance with the applicable emission standards (or family particulate emission limit, as applicable), including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable), as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tune-up and what accessories (e.g., air conditioner), if any, should be in operation;

(E) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to light-duty vehicles;

(F) For vehicles which are part of the diesel particulate averaging program, the family particulate emission limit to which the vehicle is certified;

(G) For vehicles that have been exempted from compliance with the emission standards at high altitude, as specified in § 86.085-8(h),

(*1*) A highlighted statement (e.g., underscored or boldface letters) that the vehicle is certified to applicable emission standards at low altitude only,

(*2*) A statement that the vehicle's unsatisfactory performance under high-altitude conditions makes it unsuitable for principal use at high altitude, and

(*3*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart V, do not apply when the vehicle is tested at high altitude; and

(H) For vehicles that have been exempted from compliance with the emission standards at low altitude, as specified in § 86.085-8(i),

(*1*) A highlighted statement (e.g., underscored or boldface letters) that the vehicle is certified to applicable emission standards at high altitude only, and

(*2*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart V, do not apply when the vehicle is tested at low altitude.

(2) *Light-duty trucks.* (i) A legible, permanent label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label.

(A) The label heading: Important Vehicle Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family identification;

(D) Engine tune-up specifications and adjustments, as recommended by the manufacturer in accordance with the applicable emission standards (or family particulate limit as appropriate), including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable), as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tune-up and what accessories (e.g., air conditioner), if any, should be in operation. If adjustments or modifications to the vehicle are necessary to insure compliance with emission standards (or family particulate limit, as appropriate) at either high or low altitude, the manufacturer shall either include the instructions for such adjustments on the label, or indicate on the label where instructions for such adjustments may be found. The label shall indicate whether the engine tune-up or adjustment specifications are applicable to high altitude, low altitude or both;

(E) The prominent statement: "This vehicle conforms to U.S. EPA regulations applicable to 19—— Model Year New Light-Duty Trucks."

(F) If the manufacturer is provided an alternate useful-life period under the provisions of § 86.085-21(f), the prominent statement: "This vehicle has been certified to meet U.S. EPA standards for a useful-life period of —— years or ——— miles of operation, whichever occurs first. This vehicle's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than years or miles (*e.g.*, hours, or miles only);

(G) A statement, if applicable, that the adjustments or modifications indicated on the label are necessary to ensure emission control compliance at the altitude specified;

(H) A statement, if applicable, that the high-altitude vehicle was designated or modified for principal use at high altitude. This statement must be affixed by the manufacturer at the time of assembly or by any dealer who performs the high-altitude modification or adjustment prior to sale to an ultimate purchaser;

(I) For vehicles that have been exempted from compliance with the high-altitude emission standards, as specified in § 86.085-9(g)(2),

(*1*) A highlighted statement (e.g., underscored or boldface letters) that the vehicle is certified to applicable emission standards at low altitude only,

(*2*) A statement that the vehicle's unsatisfactory performance under high-altitude conditions makes it unsuitable for principal use at high altitude, and

(*3*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart I, do not apply when the vehicle is tested at high altitude; and,

(J) For vehicles which are part of the diesel particulate averaging program, the family particulate emission limit to which the vehicle is certified.

(3) *Heavy-duty engines.* (i) A permanent legible label shall be affixed to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Important Engine Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family and model designations;

(D) Date of engine manufacture (month and year). The manufacturer may, in lieu of including the date of manufacture on the engine label, maintain a record of the engine manufacture dates. The manufacturer shall provide the date of manufacture records to the Administrator upon request;

(E) Engine specifications and adjustments as recommended by the manufacturer. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air conditioner), if any, should be in operation;

(F) For gasoline-fueled engines the label should include the idle speed, ignition timing, and the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), and valve lash;

(G) For diesel engines the label should include the advertised hp at rpm, fuel rate at advertised hp in mm^3/stroke, valve lash, initial injection timing, and idle speed;

(H) The prominent statement: "This engine conforms to U.S. EPA regulations applicable to 19—— Model Year New Heavy-Duty Engines."

(I) If the manufacturer is provided with an alternate useful-life period under the provisions of § 86.085-21(f), the prominent statement: "This engine has been certified to meet U.S. EPA standards for a useful-life period of ——— miles or —— hours of operation, whichever occurs first. This engine's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than miles or hours (*e.g.*, years, or hours only);

(J) *For diesel engines.* The prominent statement: "This engine has a primary intended service application as a ———-heavy-duty diesel engine." (The primary intended service applications are light, medium, and heavy, as defined in § 86.085-2);

(K) *For gasoline-fueled engines.* One of the following statements as applicable:

(*1*) For engines certified to the emission standards under § 86.087-10(a)(1)(i), the statement: "This engine is certified for use in all heavy-duty vehicles."

(*2*) For engines certified under the provisions of § 86.087-10(a)(3)(i), the statement: "This engine is certified for use in all heavy-duty vehicles under the special provision of 40 CFR 86.087-10(a)(3)(i)."

(*3*) For engines certified to the emission standards under § 86.087-10(a)(1)(ii), the statement: "This engine is certified for use only in heavy-duty vehicles with a gross vehicle weight rating above 14,000 lbs."

(iv) The label may be made up of one or more pieces; *Provided,* That all pieces are permanently attached to the same engine or vehicle part as applicable.

(4)(i) *Gasoline-fueled heavy-duty vehicles.* A permanent, legible label shall be affixed in a readily visible position in the engine compartment. If such vehicles do not have an engine compartment, the label required in paragraphs (a)(4) and (g)(1) of this section shall be affixed in a readily visible position on the operator's enclosure or on the engine.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numericals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Evaporative family identification;

(D) The maximum nominal fuel tank capacity (in gallons) for which the evaporative control system is certified; and,

(E) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to gasoline-fueled heavy-duty vehicles.

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle (or engine) conforms to any applicable state emission standards for new motor vehicles (or new motor vehicle engines) or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the vehicle (or engine).

(c)(1) The manufacturer of any light-duty vehicle or light-duty truck subject to the emission standards (or family particulate emission limits, as appropriate) of this subpart shall, in addition and subsequent to setting forth those statements on the label required by the Department of Transportation (DOT) pursuant to 49 CFR 567.4, set forth on the DOT label or on an additional label located in proximity to the DOT label and affixed as described in 40 CFR 567.4(b), the following information in the English language, lettered in block letters and numerals not less than three thirty-seconds of an inch high, of a color that contrasts with the background of the label:

(i) The Heading: "Vehicle Emission Control Information."

(ii)(A) *For light-duty vehicles,* the statement: "This Vehicle Conforms to U.S. EPA Regulations Applicable to 19—— Model Year New Motor Vehicles."

(B) *For light-duty trucks.* (*1*) The statement: "This vehicle conforms to U.S. EPA regulations applicable to 19—— Model Year New Light-Duty Trucks."

(*2*) If the manufacturer is provided an alternate useful-life period under the provisions of § 86.085-21(f), the prominent statement: "This vehicle has been certified to meet U.S. EPA standards for a useful-life period of —— years or ——— miles of operation, whichever occurs first. This vehicle's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than years or miles (*e.g.*, hours, or miles only).

(iii) One of the following statements, as applicable, in letters and numerals not less than six thirty-seconds of an inch high and of a color that contrasts with the background of the label:

(A) For all vehicles certified as non-catalyst-equipped: "NON-CATALYST"

(B) For all vehicles certified as catalyst-equipped which are included in a manufacturer's catalyst control program for which approval has been given by the Administrator: "CATALYST—APPROVED FOR IMPORT"

(C) For all vehicles certified as catalyst-equipped which are not included in a manufacturer's catalyst control program for which prior approval has been given by the Administrator: "CATALYST"

(2) In lieu of selecting either of the labeling options of paragraph (c)(1) of this section, the manufacturer may add the information required by paragraph (c)(1)(iii) of this section to the label required by paragraph (a) of this section. The required information will be set forth in the manner prescribed by paragraph (c)(1)(iii) of this section.

(d) Incomplete light-duty trucks or incomplete heavy-duty vehicles optionally certified as light-duty trucks shall have the following prominent statement printed on the label required by paragraph (a)(2) of this section in lieu of the statement required by paragraph (a)(2)(iii)(E) of this section: "This vehicle conforms to U.S. EPA regulations applicable to 19—— Model Year New Light-Duty Trucks when completed at a maximum curb weight of ——— pounds or at a maximum gross vehicle weight rating of ——— pounds or with a maximum frontal area of ——— square feet."

(e) Incomplete heavy-duty vehicles having a gross vehicle weight rating of 8,500 pounds or less shall have one of the following statements printed on the label required by paragraph (a)(3) of this section in lieu of the statement required by paragraph (a)(3)(iii)(H) of this section: "This engine conforms to U.S. EPA regulations applicable to 19—— Model Year New Heavy-Duty Engines when installed in a vehicle completed at a curb weight of more than 6,000 pounds or with a frontal area of greater than 45 square feet."

(f) The manufacturer of any imcomplete light-duty vehicle or light-duty truck shall notify the purchaser of such vehicle of any curb weight, frontal area, or gross vehicle weight rating limitations affecting the emission certificate applicable to that vehicle. This notification shall be transmitted in a manner consistent with National Highway Traffic Safety Administration safety notification requirements published in 49 CFR Part 568.

(g)(1) Incomplete gasoline-fueled heavy-duty vehicles shall have the following prominent statement printed on the label required in paragraph (a)(4) of this section: "(Manufacturer's corporate name) has determined that this vehicle conforms to U.S. EPA regulations applicable to 19—— Model Year New Gasoline-Fueled Heavy-Duty Vehicles when completed with a nominal fuel tank capacity not to exceed ——— gallons. Persons wishing to add fuel tank capacity beyond the above maximum must submit a written statement to the Administrator that the hydrocarbon storage system has been upgraded according to the requirements of 40 CFR 86.085-35(g)(2)."

(2) Persons wishing to add fuel tank capacity beyond the maximum specified on the label required in paragraph (g)(1) of this section shall:

(i) Increase the amount of fuel tank vapor storage material according to the following function:

$$\mathrm{Cap}_f = \mathrm{Cap}_i \left(\frac{\text{T. Vol.}}{\text{Max. Vol.}} \right)$$

Where:

Cap_f = final amount of fuel tank vapor storage material, grams

Cap_i = initial amount of fuel tank vapor storage material, grams

T. Vol. = total fuel tank volume of completed vehicle, gallons

Max. Vol. = maximum fuel tank volume as specified on the label required in paragraph (g)(1) of this section, gallons

(ii) Use, if applicable, hosing for fuel vapor routing which is at least as impermeable to hydrocarbon vapors as that used by the primary manufacturer.

(iii) Use vapor storage material with the same adsorptive characteristics as that used by the primary manufacturer.

(iv) Connect, if applicable, any new hydrocarbon storage device to the existing hydrocarbon storage device in series such that the original hydrocarbon storage device is situated between the fuel tank and the new hydrocarbon storage device. The original hydrocarbon storage device shall be sealed such that vapors cannot reach the atmosphere. The elevation of the original hydrocarbon storage device shall be equal to or lower than the new hydrocarbon storage device.

(v) Submit a written statement to the Administrator that paragraphs (g)(2)(i) through (g)(2)(iv) of this section have been complied with.

(3) If applicable, the Administrator will send a return letter verifying the receipt of the written statement required in paragraph (g)(2)(v) of this section.

(h)(1) Light-duty trucks and heavy-duty vehicles and engines for which nonconformance penalties are to be paid in accordance with § 86.1113-87(b) shall have the following information printed on the label required in paragraph (a) of this section or on a separate permanent legible label in the English language and located in proximity to the label required in paragraph (a) of this section. The manufacturer shall begin labeling production engines or vehicles within 10 days after the completion of the PCA.

(i) The statement: "The manufacturer of this engine/vehicle will pay a nonconformance penalty to be allowed to introduce it into commerce at an emission level higher than the applicable emission standard. The compliance level (or new emission standard) for this engine/vehicle is ————." (The manufacturer shall insert the applicable pollutant and compliance level calculated in accordance with § 86.1112-87(a).)

(2) If a manufacturer introduces an engine or vehicle into commerce prior to the compliance level determination of § 86.1112-87(a), it shall provide the engine or vehicle owner with a label as described above to be affixed in a location in proximity to the label required in paragraph (a) of this section within 30 days of the completion of the PCA.

[48 FR 52199, Nov. 16, 1983, as amended at 50 FR 53466, Dec. 31, 1985]

§ 86.087–38 Maintenance instructions.

(a) The manufacturer shall furnish or cause to be furnished to the purchaser of each new motor vehicle (or motor vehicle engine) subject to the standards prescribed in § 86.087-8, § 86.087-9, § 86.087-10, or § 86.087-11, as applicable, written instructions for the proper maintenance and use of the vehicle (or engine), by the purchaser consistent with the provisions of § 86.087-25, which establishes what scheduled maintenance the Administrator approves as being reasonable and necessary. For light-duty vehicle manufacturers optionally complying with § 86.087-25(a) for the 1987 model year, the Administrator approves any scheduled maintenance allowed by § 86.087-25(a) as being reasonable and necessary.

(1) The maintenance instructions required by this section shall be in clear, and to the extent practicable, nontechnical language.

(2) The maintenance instructions required by this section shall contain a general description of the documentation which the manufacturer will require from the ultimate purchaser or any subsequent purchaser as evidence of compliance with the instructions.

(b) Instructions provided to purchasers under paragraph (a) of this section shall specify the performance of all scheduled maintenance performed by the manufacturer on certification durability vehicles and, in cases where the manufacturer performs less maintenance on certification durability vehicles than the allowed limit, may specify the performance of any scheduled maintenance allowed under § 86.087-25 (or under § 86.085-25(a), for light-duty vehicle families optionally complying with that section for the 1987 model year).

(c) Scheduled emission-related maintenance in addition to that performed under § 86.087-25(b) may only be recommended to offset the effects of abnormal in-use operating conditions, except as provided in paragraph (d) of this section. The manufacturer shall be required to demonstrate, subject to the approval of the Administrator, that such maintenance is reasonable and technologically necessary to assure the proper functioning of the emission control system. Such additional recommended maintenance shall be clearly differentiated, in a form approved by the Administrator, from that approved under § 86.087-25(b).

(d) Inspections of emission-related parts or systems with instructions to replace, repair, clean, or adjust the parts or systems if necessary, are not considered to be items of scheduled maintenance which insure the proper functioning of the emission control system. Such inspections, and any recommended maintenance beyond that approved by the Administrator as reasonable and necessary under paragraphs (a), (b), and (c) of this section, may be included in the written instructions furnished to vehicle owners under paragraph (a) of this section: *Provided,* That such instructions clearly state, in a form approved by the Administrator, that the owner need not perform such inspections or recommended maintenance in order to maintain the emission warranty or manufacturer recall liability.

(e) If the vehicle has been granted an alternative useful life period under the provisions of § 86.087-21(f), the manufacturer may choose to include in such instructions an explanation of the distinction between the alternative useful life specified on the label, and the emissions defect and emissions performance warranty period. The explanation must clearly state that the useful life period specified on the label represents the average period of use up to retirement or rebuild for the engine family represented by the engine used in the vehicle. An explanation of how the actual useful lives of engines used in various applications are expected to differ from the average useful life may be included. The explanation(s) shall be in clear, nontechnical language that is understandable to the ultimate purchaser.

(f) If approved by the Administrator, the instructions provided to purchasers under paragraph (a) of this section shall indicate what adjustments or modifications, if any, are necessary to allow the vehicle to meet applicable emission standards at elevations above 4,000 feet, or at elevations of 4,000 feet or less.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10693, Mar. 15, 1985, as amended at 51 FR 24610, July 7, 1986]

§ 86.088-2 Definitions.

The definitions in § 86.085-2 remain effective. The definitions in this section apply beginning with the 1988 model year.

Composite NO_x standard, for a manufacturer which elects to average light-duty trucks subject to the NO_x standard of § 86.088-9(a)(iii)(A) together with those subject to the NO_x standard of § 86.088-9(a)(iii)(B) in the light-duty truck NO_x averaging program, means that standard calculated according to the following equation and rounded to the nearest one-tenth gram per mile:

$$\frac{[(PROD_A)\ (STD_A)+(PROD_B)\ (STD_B)]}{[(PROD_A)+(PROD_B)]} = \text{Manufacturer's Composite } NO_x \text{ Standard,}$$

Where:

$PROD_A$=The manufacturer's total light-duty truck production for those engine families subject to the standard of § 86.088-9(a)(iii)(A) and included in the average for a given model year,

STD_A=The NO_x standard of § 86.088-9(a)(iii)(A),

$PROD_B$=The manufacturer's total light-duty truck production for those engine families subject to the standard of § 86.088-9(a)(iii)(B) and included in the average for a given model year, and

STD_B=The NO_x standard of § 86.088-9(a)(iii)(B).

Critical emission-related components are those components which are designed primarily for emission control, or whose failure may result in a significant increase in emissions accompanied by no significant impairment (or perhaps even an improvement) in performance, driveability, and/or fuel economy as determined by the Administrator.

Critical emission-related maintenance means that maintenance to be performed on critical emission-related components.

Emission-related maintenance means that maintenance which does substantially affect emissions or which is likely to affect the emissions deterioration of the vehicle or engine during normal in-use operation, even if the maintenance is performed at some time other than that which is recommended.

Family NO_x emission limit means the NO_x emission level to which an engine family is certified in the light-duty truck NO_x averaging program, expressed to one-tenth of a gram per mile accuracy.

Non-emission-related maintenance means that maintenance which does not substantially affect emissions and which does not have a lasting effect on the emissions deterioration of the vehicle or engine during normal in-use operation once the maintenance is performed.

Production-weighted NO_x average means the manufacturer's production-weighted average NO_x emission level, for certification purposes, of all of its light-duty truck engine families included in the NO_x averaging program. It is calculated at the end of the model year by multiplying each family NO_x emission limit by its respective production, summing those terms, and dividing the sum by the total production of the effected families. Those vehicles produced for sale in California or at high altitude shall each be averaged separately from those produced for sale in any other area.

Production-weighted particulate average means the manufacturer's production-weighted average particulate emission level, for certification purposes, of all of its diesel engine families included in the particulate averaging program. It is calculated at the end of the model year by multiplying each family particulate emission limit by its respective production, summing those terms, and dividing the sum by the total production of the effected families. Those vehicles produced for sale in California or at high altitude shall each be averaged separately from those produced for sale in any other area.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10648, Mar. 15, 1985]

§ 86.088-9 Emission standards for 1988 and later model year light-duty trucks.

(a)(1) The standards set forth in paragraphs (a) through (c) of this section shall apply to light-duty trucks sold for principal use at other than a designated high-altitude location. Exhaust emissions from 1988 and later model year light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 0.80 gram per vehicle mile (0.50 gram per vehicle kilometer).

(ii)(A) *Carbon monoxide.* 10 grams per vehicle mile (6.2 grams per vehicle kilometer).

(B) 0.50 percent of exhaust gas flow at curb idle (gasoline-fueled light-duty trucks only).

(iii) *Oxides of nitrogen.* (A) For light-duty trucks up to and including 3,750 lbs. loaded vehicle weight and 6,000 lbs. or less gross vehicle weight, 1.2 grams per vehicle mile (0.75 grams per vehicle kilometer).

(B) For light-duty trucks greater than 3,750 lbs. loaded vehicle weight and 6,000 lbs. or less gross vehicle weight, 1.7 grams per vehicle mile (1.1 grams per vehicle kilometer).

(C) For light-duty trucks 6,001 lbs. gross vehicle weight and greater, 2.3 grams per vehicle mile (1.4 grams per vehicle kilometer). As an option, a manufacturer may elect to certify all or some of its engine families for light-duty trucks of 6,001 lbs gross vehicle weight and greater according to paragraph (a)(1)(iii)(A), or (a)(1)(iii)(B) of this section, as applicable for the loaded vehicle weight. Such vehicles could also be included in the averaging program of paragraph (a)(1)(iii)(D) of this section.

(D) A manufacturer may elect to include all or some of its light-duty truck engine families in paragraphs (a)(1)(iii)(A) and (a)(1)(iii)(B) of this section in the NO_x averaging program, provided that trucks produced for sale in California or in designated high altitude areas may be averaged only within each of those areas. Diesel and gasoline fueled engine families may not be averaged together. If the manufacturer elects to average together NO_x emissions of light-duty trucks subject to the standards of paragraphs (a)(1)(iii)(A), and (a)(1)(iii)(B) of this section, its composite NO_x standard applies to the combined fleets of light-duty trucks up to and including, and over 3,750 lbs. loaded vehicle weight and 6,000 lbs. or less gross vehicle weight included in the average and is calculated as defined in § 86.088-2.

(iv) *Particulate emissions* (diesels only).

(A) For light-duty trucks up to and including 3,750 lbs loaded vehicle weight, 0.26 grams per vehicle mile (0.16 grams per vehicle kilometer).

(B) For light-duty trucks 3,751 lbs and greater loaded vehicle weight, 0.45 grams per vehicle mile (0.28 grams per vehicle kilometer).

(C) A manufacturer may elect to include all or some of its light-duty truck engine families subject to the standard of paragraph (a)(1)(iv)(A) of this section in the particulate averaging program, provided that trucks produced for sale in California or in designated high-altitude areas may be averaged only within each of those areas. If the manufacturer elects to average together particulate emissions of light-duty trucks subject to the standard of paragraph (a)(1)(iv)(A) of this section with the particulate emissions of diesel light-duty vehicles, its composite particulate standard applies to the combined fleets of those light-duty trucks and diesel light-duty vehicles included in the average and is calculated as defined in § 86.085-2.

(2) The standards set forth in paragraph (a)(1)(i), (a)(1)(ii)(A), (a)(1)(iii), and (a)(1)(iv) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures. The standard set forth in paragraph (a)(1)(ii)(B) of this section refers to the exhaust emitted at curb idle and measured and calculated in accordance with the procedures set forth in Subpart P of this part.

(b)(1) Fuel evaporative emissions from 1988 and later model year gasoline-fueled light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1988 and later model year light-duty truck.

(d)(1) Model year 1988 and later light-duty trucks sold for principal use at a designated high-altitude location shall be capable of meeting the following exhaust emission standards when tested under high-altitude conditions:

(i) *Hydrocarbons.* 1.0 grams per vehicle mile (0.62 grams per vehicle kilometer);

(ii) *Carbon Monoxide.* (A) 14 grams per vehicle mile (8.7 grams per vehicle kilometer).

(B) 0.50 percent of exhaust gas flow at curb idle (gasoline-fueled light-duty trucks only).

(iii) *Oxides of nitrogen.* (A) For light-duty trucks up to and including 3,750 lbs. loaded vehicle weight and 6,000 lbs. or less gross vehicle weight, 1.2 grams per vehicle mile (0.75 grams per vehicle kilometer).

(B) For light-duty trucks greater than 3,750 lbs. loaded vehicle weight and 6,000 lbs. or less gross vehicle weight, 1.7 grams per vehicle mile (1.1 grams per vehicle kilometer).

(C) For light-duty trucks 6,001 lbs. gross vehicle weight and greater, 2.3 grams per vehicle mile (1.4 grams per vehicle kilometer). As an option, a manufacturer may elect to certify all or some of its engine families for light-duty trucks of 6,001 lbs. gross vehicle weight and greater according to paragraph (d)(1)(iii)(A), or (d)(1)(iii)(B) of this section, as applicable for the loaded vehicle weight.

(iv) *Particulate emissions* (diesels only). For light-duty trucks up to and including 3,750 lbs loaded vehicle weight, 0.26 grams per vehicle mile (0.16 gram per vehicle kilometer).

(2) The standards set forth in paragraph (d)(1)(i), (d)(1)(ii)(A), (d)(1)(iii), and (d)(1)(iv) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures. The standard set forth in paragraph (d)(1)(ii)(B) of this section refers to the exhaust emitted at curb idle and measured and calculated in accordance with the procedures set forth in Subpart P of this part.

(e)(1) Fuel evaporative emissions from 1988 and later model year gasoline-fueled light-duty trucks sold for principal use at a designated high-altitude location shall not exceed 2.6 grams per test when tested under high-altitude conditions.

(2) The standard set forth in paragraph (e)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(f) No crankcase emissions shall be discharged into the ambient atmosphere from any 1988 and later model year light-duty trucks sold for principal use at a designated high-altitude location.

(g)(1) Any light-duty truck that a manufacturer wishes to certify for sale at low altitude must be capable of meeting high-altitude emission standards (specified in paragraphs (d) through (f) of this section). The manufacturer may specify vehicle adjustments or modifications to allow the vehicle to meet high-altitude standards but these adjustments or modifications may not alter the vehicle's basic engine, inertia weight class, transmission configuration, and axle ratio.

(i) A manufacturer may certify unique configurations to meet the high-altitude standards but is not required to certify these vehicle configurations to meet the low-altitude standards.

(ii) Any adjustments or modifications that are recommended to be performed on vehicles to satisfy the requirements of paragraph (g)(1) of this section:

(A) Shall be capable of being effectively performed by commercial repair facilities, and

(B) Must be included in the manufacturer's application for certification.

(2) The manufacturer may exempt 1985 and later model year vehicles from compliance with the high-altitude emission standards set forth in paragraphs (d) and (e) of this section if the vehicles are not intended for sale at high altitude and if the following requirements are met. A vehicle configuration shall only be considered eligible for exemption if the requirements of either paragraph (g)(2)(i), (ii), (iii), or (iv) of this section are met.

(i) Its design parameters (displacement-to-weight ratio (D/W) and engine speed-to-vehicle-speed ratio (N/V)) fall within the exempted range for that manufacturer for that year. The exempted range is determined according to the following procedure:

(A) The manufacturer shall graphically display the D/W and N/V data of all vehicle configurations it will offer for the model year in question. The axis of the abscissa shall be D/W (where (D) is the engine displacement expressed in cubic centimeters and (W) is the gross vehicle weight (GVW) expressed in pounds), and the axis of the ordinate shall be N/V (where (N) is the crankshaft speed expressed in revolutions per minute and (V) is the vehicle speed expressed in miles per hour). At the manufacturer's option, either the 1:1 transmission gear ratio or the lowest numerical gear ratio available in the transmission will be used to determine N-V. The gear selection must be the same for all N/V data points on the manufacturer's graph. For each transmission/axle ratio combination, only the lowest N/V value shall be used in the graphical display.

(B) The product line is then defined by the equation, $N/V=C(D/W)^{-0.9}$, where the constant, C, is determined by the requirement that all the vehicle data points either fall on the line or lie to the upper right of the line as displayed on the graphs.

(C) The exemption line is then defined by the equation, $N/V=C(0.84\ D/W)^{-0.9}$, where the constant, C is the same as that found in paragraph (g)(2)(i)(B) of this section.

(D) The exempted range includes all values of N/V and D/W which simultaneously fall to the lower left of the exemption line as drawn on the graph.

(ii) Its design parameters fall within the alternate exempted range for that manufacturer that year. The alternate exempted range is determined by substituting rated horsepower (hp) for displacement (D) in the exemption procedure described in paragraph (g)(2)(i) of this section and by using the product line $N/V=C(hp/W)^{-0.9}$.

(A) Rated horsepower shall be determined by using the Society of Automotive Engineers Test Procedure J 1349, or any subsequent version of that test procedure. Any of the horsepower determinants within that test procedure may be used, as long as it is used consistently throughout the manufacturer's product line in any model year.

(B) No exemptions will be allowed under paragraph (g)(2)(ii) of this section to any manufacturer that has exempted vehicle configurations as set forth in paragraph (g)(2)(i) of this section.

(iii) Its acceleration time (the time it takes a vehicle to accelerate from 0 to a speed not less than 40 miles per hour and not greater than 50 miles per hour) under high-altitude conditions is greater than the largest acceleration time under low-altitude conditions for that manufacturer for that year. The procedure to be followed in making this determination is:

(A) The manufacturer shall list the vehicle configuration and acceleration time under low-altitude conditions of that vehicle configuration which has the highest acceleration time under low-altitude conditions of all the vehicle configurations it will offer for the model year in question. The manufacturer shall also submit a description of the methodology used to make this determination.

(B) The manufacturer shall then list the vehicle configurations and acceleration times under high-altitude conditions of all those vehicle configurations which have higher acceleration times under high-altitude conditions than the highest acceleration time at low altitude identified in paragraph (g)(2)(iii)(A) of this section.

(iv) In lieu of performing the test procedure of paragraph (g)(2)(iii) of this section, its acceleration time can be estimated based on the manufacturer's engineering evaluation, in accordance with good engineering practice, to meet the exemption criteria of paragraph (g)(2)(iii) of this section.

(3) The sale of a vehicle for principal use at a designated high-altitude location that has been exempted as set forth in paragraph (g)(2) of this section will be considered a violation of Section 203(a)(1) of the Clean Air Act.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10650, Mar. 15, 1985, as amended at 51 FR 24608, July 7, 1986; 52 FR 47864, Dec. 16, 1987; 53 FR 43876, Oct. 31, 1988]

§ 86.088–10 Emission standards for 1988 and 1989 model year gasoline-fueled heavy-duty engines and vehicles.

(a)(1) Exhaust emissions from new 1988 and later model year gasoline-fueled heavy-duty engines shall not exceed:

(i) For engines intended for use in all vehicles except as provided in paragraph (a)(3) of this paragraph,

(A) *Hydrocarbons.* 1.1 grams per brake horsepower-hour, as measured under transient operating conditions.

(B) *Carbon monoxide.* (*1*) 14.4 grams per brake horsepower-hour, as measured under transient operating conditions.

(*2*) *Gasoline-fueled heavy-duty engines utilizing aftertreatment technology.* 0.50 percent of exhause gas flow at curb idle.

(C) *Oxides of nitrogen.* 10.6 grams per brake horsepower-hour, as measured under transient operating conditions.

(ii) For engines intended for use only in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 pounds,

(A) *Hydrocarbons.* 1.9 grams per brake horsepower-hour, as measured under transient operating conditions.

(B) *Carbon monoxide.* (*1*) 37.1 grams per brake horsepower-hour as measured under transient operating conditions.

(*2*) *Gasoline-fueled heavy-duty engines utilizing aftertreatment technology.* 0.50 percent of exhaust gas flow at curb idle.

(C) *Oxides of nitrogen.* 10.6 grams per brake horsepower-hour, as measured under transient operating conditions.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over the operating schedule set forth in paragraph (f)(1) of Appendix I to this part, and measured and calculated in accordance with the procedures set forth in Subparts N or P.

(3)(i) A manufacturer may certify one or more gasoline-fueled heavy-duty engine configurations intended for use in all vehicles to the emission standards set forth in paragraph (a)(1)(ii) of this paragraph: *Provided,* That the total model year sales of such configuration(s) being certified to the emission standards in paragraph (a)(1)(ii) of this section represent no more than 5 percent of total model year sales of all gasoline-fueled heavy-duty engines intended for use in vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds by the manufacturer.

(ii) The configurations certified to the emission standards of paragraph (a)(1)(ii) of this section under the provisions of paragraph (a)(3)(i) of this section shall still be required to meet the evaporative emission standards set forth in paragraphs (b)(1)(i)(A) and (b)(2)(i) of this section.

(b)(1) Evaporative emissions from 1988 and later model year gasoline-fueled heavy-duty vehicles shall not exceed:

(i) *Hydrocarbons.* (A) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds, 3.0 grams per test.

(B) For vehicles with a Gross Vehicle Weight Rating of greater than 14,000 pounds, 4.0 grams per test.

(2)(i) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, the standards set forth in paragraph (b)(1) of this section refer to a composite sample of fuel evaporative emissions collected under the conditions set forth in Subpart M and measured in accordance with those procedures.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 26,000 pounds, the standard set forth in paragraph (b)(1)(i)(B) of this section refers to the manufacturer's engineering design evaluation using good engineering practice (a statement of which is required in § 86.088-23(b)(4)(ii)).

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1988 or later model year gasoline-fueled heavy-duty engine.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subpart N or P of this part to ascertain that such test engines meet the requirements of paragraphs (a) and (c) of this section.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10651, Mar. 15, 1985, as amended at 52 FR 47864, Dec. 16, 1987]

§ 86.088-11 Emission standards for 1988 and later model year diesel heavy-duty engines.

(a)(1) Exhaust emissions from new 1988 and later model year diesel heavy-duty engines shall not exceed the following:

(i) *Hydrocarbons.* 1.3 grams per brake horsepower-hour, as measured under transient operating conditions.

(ii) *Carbon monoxide.* 15.5 grams per brake horsepower-hour, as measured under transient operating conditions.

(iii) *Oxides of nitrogen.* 10.7 grams per brake horsepower-hour, as measured under transient operating conditions.

(iv) *Particulate emissions.* 0.60 gram per brake horsepower-hour, as measured under transient operating conditions.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over the operating schedule set forth in paragraph (f)(2) of Appendix I to this part, and measured and calculated in accordance with the procedures set forth in Subpart N of this part, except as noted in § 86.088-23(c)(2) (i) and (ii).

(b)(1) The opacity of spoke emission from new 1988 and later model year diesel heavy-duty engines shall not exceed:

(i) 20 percent during the engine acceleration mode.

(ii) 15 percent during the engine lugging mode.

(iii) 50 percent during the peaks in either mode.

(2) The standards set forth in paragraph (b)(1) of this section refer to exhaust smoke emissions generated under the conditions set forth in Subpart I of this part and measured and calculated in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the atmosphere from any new 1988 model year naturally aspirated diesel heavy-duty engine. This provision does not apply to engines using turbochargers, pumps, blowers, or superchargers for air induction.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subpart I or N of this part to ascertain that such test engines meet the requirements of (a), (b), and (c) of this section.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10653, Mar. 15, 1985, as amended at 52 FR 47864, Dec. 16, 1987]

§ 86.088-21 Application for certification.

(a) A separate application for a certificate of conformity shall be made for each set of standards (or family particulate emission limits, or family NO_x emission limits, as appropriate) and each class of new motor vehicles or new motor vehicle engines. Such application shall be made to the Administrator by the manufacturer and shall be updated and corrected by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1)(i) Identification and description of the vehicles (or engines) covered by the application and a description of their engine (vehicles only), emission control system and fuel system components. This shall include a detailed description of each auxiliary emission control device (AECD) to be installed in or on any certification test vehicle (or certification test engine).

(ii)(A) The manufacturer shall provide to the administrator in the application for certification:

(*1*) A list of those parameters which are physically capable of being adjusted (including those adjustable parameters for which access is difficult) and that, if adjusted to settings other than the manufacturer's recommended setting, may affect emissions;

(*2*) A specification of the manufacturer's intended physically adjustable range of each such parameter, and the production tolerances of the limits or stops used to establish the physically adjustable range;

(*3*) A description of the limits or stops used to establish the manufacturer's intended physically adjustable range of each adjustable parameter, or any other means used to inhibit adjustment;

(*4*) The nominal or recommended setting, and the associated production tolerances, for each such parameter.

(B) The manufacturer may provide in the application for certification, information relating to why certain parameters are not expected to be adjusted in actual use and to why the physical limits or stops used to establish the physically adjustable range of each parameter, or any other means used to inhibit adjustment, are expected to be effective in preventing adjustment of parameters on in-use vehicles to settings outside the manufacturer's intended physically adjustable ranges. This may include results of any tests to determine the difficulty of gaining access to an adjustment or exceeding a limit as intended or recommended by the manufacturer.

(C) The Administrator may require to be provided detailed drawings and descriptions of the various emission related components, and/or hardware samples of such components, for the purpose of making his determination of which vehicle or engine parameter will be subject to adjustment for new certification and Selective Enforcement Audit testing and of the physically adjustable range for each such vehicle or engine parameter.

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles (or engines) for which certification is requested. The sales data shall also include the altitude of intended sale for light-duty trucks.

(3) A description of the test equipment and fuel proposed to be used.

(4)(i) For light-duty vehicles and light-duty trucks, a description of the test procedures to be used to establish the evaporative emission deterioration factors required to be determined and supplied in § 86.088-23(b)(2).

(ii) For gasoline-fueled heavy-duty vehicles, the Administrator does not assume that each evaporative emission family-evaporative emission control system combination will deteriorate in a unique manner during the useful life of the vehicle. The manufacturer shall therefore identify those evaporative emission deterioration factors which shall be applied to the various evaporative emission family-evaporative emission control system combinations which are expected to exhibit similar deterioration characteristics during the useful life of the vehicle.

(iii)(A) a description of the test procedures to be used to establish the durability data or the exhaust emission deterioration factors required to be determined and supplied in § 86.088-23(b)(1).

(B)(*1*) For engine families provided an alternative useful-life period under paragraph (f) of this section, a statement of that alternative period and a brief synopsis of the justification.

(*2*) For heavy-duty diesel engine families, a statement of the primary intended service class (light, medium, or heavy) and an explanation as to why that service class was selected. Each diesel engine family shall be certified under one primary intended service class only. After reviewing the guidance in § 86.085-2, the class shall be determined on the basis of which class best represents the majority of the sales of their engine family.

(C)(*1*) A statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(*2*) A description of vehicle adjustments or modifications necessary, if any, to assure that light-duty vehicles and light-duty trucks covered by a certificate of conformity conform to the regulations while being operated at any altitude locations, and a statement of the altitude at which the adjustments or modifications apply.

(D) At the option of the manufacturer, the proposed composition of the emission-data test fleet or (where applicable) the durability-data test fleet.

(5)(i)(A) If the manufacturer elects to participate in the particulate averaging program for diesel light-duty vehicles and/or diesel light-duty trucks, the application must list the family particulate emission limit and the projected U.S. production volume of the family for the model year.

(B) The manufacturer shall choose the level of the family particulate emission limits, accurate to one-hundredth of a gram per mile.

(C) The manufacturer may at any time during production elect to change

the level of any family diesel particulate emission limit(s) by submitting the new limit(s) to the Administrator and by demonstrating compliance with the limit(s) as described in § 86.085-2 and § 86.088-28(b)(5)(i).

(ii)(A) If the manufacturer elects to participate in the NO_x averaging program for light-duty trucks, the application must list the family NO_x emission limit and the projected U.S. production volume of the family for the model year.

(B) The manufacturer shall choose the level of the family NO_x emission limits, accurate to one-tenth of a gram per mile.

(C) The manufacturer may at any time during production elect to change the level of any family NO_x emission limit(s) by submitting the new limits to the Administrator and by demonstrating compliance with the limit(s) as described in § 86.088-2 and § 86.088-28(b)(5)(ii).

(6)(i) For gasoline-fueled heavy-duty engines, the application must state whether the engine family is being certified for use in all vehicles regardless of their Gross Vehicle Weight Rating (see § 86.088-10 (a)(1)(i) and (a)(3)(i)), or, only for use in vehicles with a Gross Vehicle Weight Rating greater than 14,000 pounds.

(ii) If the engine family is being certified for use in all vehicles and, is being certified to the emission standards applicable to gasoline-fueled heavy-duty engines for use only in vehicles with a Gross Vehicle Weight Rating over 14,000 pounds under the provisions of paragraph (a)(3) of § 86.088-10, then the application must also attest that the engine family, together with all other engine families being certified under the provisions of paragraph (a)(3) of § 86.038-10, represent no more than 5 percent of model year sales of the manufacturer of all gasoline-fueled heavy-duty engines for use in vehicles with Gross Vehicle Weight Ratings of up to 14,000 pounds.

(iii)(A) A description of the test procedures to be used to establish the durability data or the exhaust emission deterioration factors required to be determined and supplied in § 86.088-23(b)(1).

(B)(*1*) A statement of the useful life of use of each light-duty truck engine family and heavy-duty engine family.

(*2*) For engine families provided an alternative useful life period under paragraph (f) of this section, a statement of that alternative period and a brief synopsis of the justification.

(*3*) For heavy-duty diesel engine families, a statement of the primary intended service class (light, medium, or heavy) and an explanation as to why that service class was selected. Each diesel engine family shall be certified under one primary intended service class only. After reviewing the guidance in § 86.085-2, the class shall be determined on the basis of which class best represents the majority of the sales of that engine family.

(7) For each light-duty vehicle engine family, a statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance and the equipment required.

(8) For each light-duty vehicle engine family, the proposed composition of the emission-data test fleet and the durability-data test fleet.

(c) Complete copies of the application and of any amendments thereto, and all notifications under § 86.079-32, § 86.079-33, and § 86.082-34 shall be submitted in such multiple copies as the Administrator may require.

(d) Incomplete light-duty trucks shall have a maximum completed curb weight and maximum completed frontal area specified by the manufacturer.

(e) For gasoline-fueled heavy-duty vehicles the manufacturer shall specify a maximum nominal fuel tank capacity for each evaporative emission family-evaporative emission control system combination.

(f) Light-duty truck and heavy-duty engine manufacturers who believe that the useful life periods of § 86.085-2 are significantly unrepresentative for one or more engine families (either too long or too short), may petition the Administrator to provide an alternative useful-life period. This petition nust include the full rationale behind he request together with any supporting data and other evidence. Based on his or other information the Administrator may assign an alternative seful-life period. Any petition should e submitted in a timely manner, to llow adequate time for a thorough valuation.

Secs. 202, 203, 206, 207, 208, 301a, Clean Air ct, as amended; 42 U.S.C. 7521, 7522, 7525, 541, 7542, 7601a)

60 FR 10654, Mar. 15, 1985, as amended at 2 FR 47864, Dec. 16, 1987]

86.088-23 Required data.

(a) The manufacturer shall perform ne tests required by the applicable est procedures, and submit to the Administrator the following information: *rovided, however,* That if requested y the manufacturer, the Administraor may waive any requirement of this ection for testing of vehicles (or enines) for which emission data are ailable or will be made available nder the provisions of § 86.088-29.

(b)(1)(i) Exhaust emission durability ata on such light-duty vehicles tested accordance with applicable test proedures and in such numbers as speciied, which will show the performance the systems installed on or incorpoted in the vehicle for extended milee, as well as a record of all pertinent aintenance performed on the test vecles.

(ii) Exhaust emission deterioration ctors for light-duty trucks and eavy-duty engines and all test data at are derived from the testing deribed under § 86.088-21(b)(4)(iii)(A) well as a record of all pertinent aintenance. Such testing shall be degned and conducted in accordance th good engineering practice to sure that the engines covered by a rtificate issued under § 86.088-30 ll meet the emission standards (or mily particulate emission limits or mily NO_x emission limits, as approiate) in § 86.088-9, § 86.088-10, or 36.088-11 as appropriate, in actual e for the useful life of the engine.

2) For light-duty vehicles and lightty trucks, evaporative emission deteoration factors for each evaporative nission family-evaporative emission ntrol system combination and all test data that are derived from testing described under § 86.088-21(b)(4)(i) designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.088-30 will meet the evaporative emission standards in § 86.087-8 or § 86.088-9, as appropriate, for the useful life of the vehicle.

(3) For gasoline-fueled heavy-duty vehicles, evaporative emission deterioration factors for each evaporative emission family-evaporative emission control system combination identified in accordance with § 86.088-21(b)(4)(ii). Furthermore, a statement that the test procedure(s) used to derive the deterioration factors includes, but need not be limited to, a consideration of the ambient effects of ozone and temperature fluctuations, and the service accumulation effects of vibration, time, and vapor saturation and purge cycling. The deterioration factor test procedure shall be designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.088-30 will meet the evaporative emission standards in § 86.088-10 in actual use for the useful life of the engine. Furthermore, a statement that a description of the test procedure, as well as all data, analyses and evaluations, is available to the Administrator upon request.

(4)(i) For gasoline-fueled heavy-duty vehicles with a Gross Vehicle Weight Rating of up to 26,000 pounds, a written statement to the Administrator certifying that the manufacturer's vehicles meet the standards of § 86.088-10 as determined by the provisions of § 86.088-28. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations, and other documents, on which the above statement is based, are available to the Administrator upon request.

(ii) For gasoline-fueled, heavy-duty vehicles with a Gross Vehicle Weight Rating of greater than 26,000 pounds, a written statement to the Administrator certifying that the manufacturer's evaporative emission control systems are designed, using good engineering practice, to meet the standards of § 86.088-10 as determined by the provisions of § 86.088-28. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations, and other documents, on which the above statement is based, are available to the Administrator upon request.

(c) *Emission data.* (1) Emission data on such vehicles tested in acordance with applicable test procedures and in such numbers as specified. These data shall include zero-mile data, if generated, and emission data generated for certification as required under § 86.084-26(a)(3)(i) or § 86.084-26(a)(3)(ii).

(2) *Certification engines.* (i) Emission data on such engines tested in accordance with applicable emission test procedures of this subpart and in such numbers as specified. These data shall include zero-hour data, if generated, and emission data generated for certification as required under § 86.084-26(c)(4). In lieu of providing emission data on CO emissions from diesel certification engines the Administrator may, on request of the manufacturer, allow the manufacturer to demonstrate (on the basis of previous emission tests, development tests, or other information) that the engine will conform with the CO emission standard of § 86.088-11.

(ii) For heavy-duty diesel engines, a manufacturer may submit hot-start data only, in accordance with Subpart N, when making application for certification. However, for conformity SEA and recall testing by the Agency, both the cold-start and hot-start test data, as specified in Subpart N, will be included in the official results.

(d) A statement that the vehicles (or engines) for which certification is requested conform to the requirements in § 86.084-5(b), and that the descriptions of tests performed to ascertain compliance with the general standards in § 86.084-5(b), and the data derived from such tests, are available to the Administrator upon request.

(e)(1) A statement that the test vehicles (or test engines) with respect to which data are submitted to demonstrate compliance with the applicable standards (or family particulate emission limits, or family NO_x emission limits, as appropriate) of this subpart are in all material respects as described in the manufacturer's application for certification, have been tested in accordance with the applicable test procedures utilizing the fuels and equipment described in the application for certification and that on the basis of such tests the vehicles (or engines) conform to the requirements of this part. If such statements cannot be made with respect to any vehicle (or engine) tested, the vehicle (or engine) shall be identified, and all pertinent data relating thereto shall be supplied to the Administrator. If, on the basis of the data supplied and any additional data as required by the Administrator, the Administrator determines that the test vehicles (or test engine) was not as described in the application for certification or was not tested in accordance with the applicable test procedures utilizing the fuels and equipment as described in the application for certification, the Administrator may make the determination that the vehicle (or engine) does not meet the applicable standards (or family particulate emission limits, or family NO_x emission limits, as appropriate). The provisions of § 86.088-30(b) shall then be followed.

(2) For evaporative emission durability, or light-duty truck or heavy-duty engine exhaust emission durability, a statement of compliance with paragraph (b)(1)(ii), (b)(2), or (b)(3) of this section, as applicable.

(f) Additionally, manufacturers participating in the diesel particulate averaging program shall submit:

(1) In the application for certification, a statement that the vehicles for which certification is requested will not, to the best of the manufacturer's belief, when included in the manufacturer's production-weighted average emission level, cause the applicable particulate standard(s) to be exceeded.

(2) No longer than 90 days after the end of a given model year of production of engine families included in the diesel particulate averaging program, the number of vehicles produced in each engine family at each certified family diesel particulate emission limit, along with the resulting produc-

ion-weighted average particulate emission level.

(g) Additionally, manufacturers participating in the light-duty truck NO_x averaging program shall submit:

(1) In the application for certifica- ion, a statement that the vehicles for vhich certification is requested will not, to the best of the manufacturer's pelief, when included in the manufac- urer's production-weighted average mission level, cause the applicable IO_x standard(s) to be exceeded.

(2) No longer than 90 days after the nd of a given model year of produc- ion of engine families included in the ght-duty truck NO_x averaging pro- ram, the number of vehicles pro- uced in each engine family at each ertified family NO_x particulate emis- ion limit, along with the resulting roduction-weighted average NO_x mission level.

nformation collection requirements con- ined in § 86.088-23 were approved by the ffice of Management and Budget under ntrol number 2060-0104)

ecs. 202, 203, 206, 207, 208, 301a, Clean Air ct, as amended; 42 U.S.C. 7521, 7522, 7525, 41, 7542, 7601a)

0 FR 10657, Mar. 15, 1985, as amended at FR 29384, July 19, 1985]

86.088–25 Maintenance.

(a) *Applicability.* This section ap- ies to light-duty vehicles, light-duty ucks, and heavy-duty engines.

(1) Maintenance performed on vehi- es, engines, subsystems, or compo- ents used to determine exhaust or aporative emission deterioration fac- rs is classified as either emission-re- ted or non-emission-related and each these can be classified as either heduled or unscheduled. Further, me emission-related maintenance is so classified as critical emission-re- ted maintenance.

(b) This section specifies emission- lated scheduled maintenance for rposes of obtaining durability data d for inclusion in maintenance in- ructions furnished to purchasers of w motor vehicles and new motor ve- cle engines under § 86.087-38.

(1) All emission-related scheduled aintenance for purposes of obtaining rability data must occur at the same leage intervals (or equivalent intervals if engines, subsystems, or components are used) that will be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle or engine under § 86.087-38. This maintenance schedule may be updated as necessary throughout the testing of the vehicle/engine provided that no maintenance operation is deleted from the maintenance schedule after the operation has been performed on the test vehicle or engine.

(2) Any emission-related maintenance which is performed on vehicles, engines, subsystems, or components must be technologically necessary to assure in-use compliance with the emission standards. The manufacturer must submit data which demonstrate to the Administrator that all of the emission-related scheduled maintenance which is to be performed is technologically necessary. Scheduled maintenance must be approved by the Administrator prior to being performed or being included in the maintenance instructions provided to purchasers under § 86.087-38. As provided below, EPA has determined that emission-related maintenance at shorter intervals than that outlined in paragraphs (b)(3) and (b)(4) of this section is not technologically necessary to ensure in-use compliance. However, the Administrator may determine that maintenance even more restrictive (*e.g.,* longer intervals) than that listed in paragraphs (b)(3) and (b)(4) of this section is also not technologically necessary.

(3) For gasoline-fueled light-duty vehicles, light-duty trucks and heavy-duty engines, emission-related maintenance in addition to, or at shorter intervals than, the following will not be accepted as technologically necessary, except as provided in paragraph (b)(7) of this section.

(i)(A) The cleaning or replacement of light-duty vehicle or light-duty truck spark plugs at 30,000 miles of use and at 30,000-mile intervals thereafter.

(B) The cleaning or replacement of gasoline-fueled heavy-duty engine spark plugs at 12,000 miles (or 360 hours) of use and at 12,000-mile (or 360-hour) intervals thereafter, for engine certified for use with leaded fuel.

(C) The cleaning or replacement of gasoline-fueled heavy-duty engine spark plugs at 25,000 miles (or 750 hours) of use and at 25,000-mile intervals (or 750-hour) intervals thereafter, for engines certified for use with unleaded fuel only.

(ii) For light-duty vehicles, the adjustment, cleaning, repair, or replacement of the following may not be performed within the 50,000-mile useful life of the vehicle:

(A) Positive crankcase ventilation valve.

(B) Emission-related hoses and tubes.

(C) Ignition wires.

(D) Carburetors (including idle mixture).

(E) Catalytic converter.

(F) Exhaust gas recirculation system (including all related filters and control valves).

(G) Air injection system components.

(H) Fuel injectors.

(I) Electronic engine control unit and its associated sensors (including oxygen sensor) and actuators.

(J) Evaporative emission canister.

(K) Turbochargers.

(iii) For light-duty trucks and heavy-duty engines, the adjustment, cleaning, repair, or replacement of the following at 50,000 miles (or 1,500 hours) of use and at 50,000-mile (or 1,500-hour) intervals thereafter:

(A) Positive crankcase ventilation valve.

(B) Emission-related hoses and tubes.

(C) Ignition wires.

(D) Idle mixture.

(iv) For light-duty trucks and heavy-duty engines, the adjustment, cleaning, repair, or replacement of the following at 80,000-miles (or 2,400-hours) of use and at 80,000-mile (or 2,400-hour) intervals thereafter:

(A) Oxygen sensor.

(v) For light-duty trucks and heavy-duty engines, the adjustment, cleaning, repair, or replacement of the following at 100,000 miles (or 3,000 hours) of use and at 100,000-mile (or 3,000-hour) intervals thereafter:

(A) Catalytic converter.

(B) Air injection system components.

(C) Fuel injectors.

(D) Electronic engine control unit and its associated sensors (except oxygen sensor) and actuators.

(E) Evaporative emission canister.

(F) Turbochargers.

(G) Carburetors.

(vi)(A) For heavy-duty engines certified for use with leaded fuel, the adjustment, cleaning, repair, or replacement of the exhaust gas recirculation (EGR) system (including all related filters and control valves) at 24,000 miles (or 720 hours) of use and at 24,000-mile (or 720-hour) intervals thereafter.

(B) For light-duty trucks, and for heavy-duty engines certified for use with unleaded fuel only, the adjustment, cleaning, repair, or replacement of the EGR system (including all related filters and control valves) at 50,000 miles (or 1,500 hours) of use and at 50,000-mile (or 1,500-hour) intervals thereafter.

(4) For diesel powered light-duty vehicles, light-duty trucks, and heavy-duty engines, emission-related maintenance in addition to, or at shorter intervals than, the following will not be accepted as technologically necessary, except as provided in paragraph (b)(7) of this section.

(i) For light-duty vehicles, the adjustment, cleaning, repair, or replacement of the following may not be performed within the 50,000-mile useful life of the vehicle:

(A) Exhaust gas recirculation system (including all related filters and control valves).

(B) Positive crankcase ventilation valve.

(C) Fuel injectors.

(D) Turbocharger.

(E) Electronic engine control unit and its associated sensors and actuators.

(F) Particulate trap or trap-oxidizer system (including related components).

(ii) For light-duty trucks and heavy-duty engines, the adjustment, cleaning, repair, or replacement of the following at 50,000 miles (or 1,500 hours) of use and at 50,000-mile (or 1,500-hour) intervals thereafter:

(A) Exhaust gas recirculation system (including all related filters and control valves).

(B) Positive crankcase ventilation valve.

(C) Fuel injector tip (cleaning *only*).

(iii) The following maintenance at 100,000 miles (or 3,000 hours) of use and at 100,000-mile (or 3,000-hour) intervals thereafter for light-duty trucks and light heavy-duty engines, or, at 150,000 miles (or 4,500 hours) of use and at 150,000-mile (or 4,500-hour) intervals thereafter for medium and heavy heavy-duty engines: The adjustment, cleaning, repair, or replacement of:

(A) Fuel injectors.

(B) Turbocharger.

(C) Electronic engine control unit and its associated sensors and actuators.

(D) Particulate trap or trap-oxidizer system (including related components).

(5) [Reserved]

(6)(i) The following components are currently defined as critical emission-related components:

(A) Catalytic converter.

(B) Air injection system components.

(C) Electronic engine control unit and its associated sensor (including oxygen sensor if installed) and actuators.

(D) Exhaust gas recirculation system (including all related filters and control valves).

(E) Positive crankcase ventilation valve.

(F) Evaporative emission system (excluding canister air filter).

(G) Particulate trap or trap-oxidizer system.

(ii) All critical emission-related scheduled maintenance must have a reasonable likelihood of being performed in-use. The manufacturer shall be required to show the reasonable likelihood of such maintenance being performed in-use, and such showing shall be made prior to the performance of the maintenance on the durability data vehicle. Critical emission-related scheduled maintenance items which satisfy one of the following conditions will be accepted as having a reasonable likelihood of the maintenance item being performed in-use:

(A) Data are presented which establish for the Administrator a connection between emissions and vehicle performance such that as emissions increase due to lack of maintenance, vehicle performance will simultaneously deteriorate to a point unacceptable for typical driving.

(B) Survey data are submitted which adequately demonstrate to the Administrator that, at an 80 percent confidence level, 80 percent of such engines already have this critical maintenance item performed in-use at the recommended interval(s).

(C) A clearly displayed visible signal system approved by the Administrator is installed to alert the vehicle driver that maintenance is due. A signal bearing the message "maintenance needed" or "check engine," or a similar message approved by the Administrator, shall be actuated at the appropriate mileage point or by component failure. This signal must be continuous while the engine is in operation, and not be easily eliminated without performance of the required maintenance. Resetting the signal shall be a required step in the maintenance operation. The method for resetting the signal system shall be approved by the Administrator.

(D) A manufacturer may desire to demonstrate through a survey that a critical maintenance item is likely to be performed without a visible signal on a maintenance item for which there is no prior in-use experience without the signal. To that end, the manufacturer may in a given model year market up to 200 randomly selected vehicles per critical emission related maintenance item without such visible signals, and monitor the performance of the critical maintenance item by the owners to show compliance with paragraphs (b)(6)(ii)(B) of this section. This option is restricted to two consecutive model years and may not be repeated until any previous survey has been completed. If the critical maintenance involves more than one engine family, the sample will be sales weighted to ensure that it is representative of all the families in question.

(E) The manufacturer provides the maintenance free of charge, and clearly informs the customer that the maintenance is free in the instructions provided under § 86.087-38.

(F) Any other method which the Administrator approves as establishing a reasonable likelihood that the critical maintenance will be performed in-use.

(iii) Visible signal systems used under paragraph (b)(6)(ii)(C) of this section are considered an element of design of the emission control system. Therefore, disabling, resetting, or otherwise rendering such signals inoperative without also performing the indicated maintenance procedure is a prohibited act under Section 203(a)(3) of the Clean Air Act, as amended in August 1977 (42 U.S.C. 7522(a)(3)).

(7) *Changes to scheduled maintenance.* (i) For maintenance practices that existed prior to the 1980 model year, only the maintenance items listed in paragraphs (b)(3) and (b)(4) of this section are currently considered by EPA to be emission-related. The Administrator may, however, determine additional scheduled maintenance items that existed prior to the 1980 model year to be emission-related by announcmeent in a FEDERAL REGISTER Notice. In no event may this notification occur later than September 1 of the calendar year two years prior to the affected model year.

(ii) In the case of any new scheduled maintenance, the manufacturer must submit a request for approval to the Administrator for any maintenance that it wishes to recommend to purchasers and perform during durability determination. New scheduled maintenance is that maintenance which did not exist prior to the 1980 model year, including that which is a direct result of the implementation of new technology not found in production prior to the 1980 model year. The manufacturer must also include its recommendations as to the category (*i.e.*, emission-related or non-emission-related, critical or non-critical) of the subject maintenance and, for suggested emission-related maintenance, the maximum feasible maintenance interval. Such requests must include detailed evidence supporting the need for the maintenance requested, and supporting data or other substantiation for the recommended maintenance category and for the interval suggested for emission-related maintenance. Requests for new scheduled maintenance must be approved prior to the introduction of the new maintenance. The Administrator will then designate the maintenance as emission-related or non-emission-related. For maintenance items established as emission-related, the Administrator will further designate the maintenance as critical if the component which receives the maintenance is a critical component under paragraph (b)(6) of this section. For each maintenance item designated as emission-related, the Administrator will also establish a technologically necessary maintenance interval, based on industry data and any other information available to EPA. Designations of emission-related maintenance items, along with their identification as critical or non-critical, and establishment of technologically necessary maintenance intervals, will be announced in the FEDERAL REGISTER.

(iii) Any manufacturer may request a hearing on the Administrator's determinations in paragraph (b)(7) of this section. The request shall be in writing, signed by an authorized representative of the manufacturer, and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If after review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078-6 with respect to such issue.

(c) Non-emission-related scheduled maintenance which is reasonable and technologically necessary (*e.g.*, oil change, oil filter change, fuel filter change, air filter change, cooling system maintenance, adjustment of idle speed, governor, engine bolt torque, valve lash, injector lash, timing, etc.) may be performed on durability-data vehicles at the intervals recommended by the manufacturer to the ultimate purchaser.

(d) *Unscheduled maintenance on light-duty durability data vehicles.* (1) Unscheduled maintenance may be performed during the testing used to determine deterioration factors, except as provided in paragraphs (d)(2) and (d)(3) of this section, only under the following provisions:

(i) A fuel injector or spark plug may be changed if a persistent misfire is detected.

(ii) Readjustment of a gasoline-fueled vehicle cold-start enrichment system may be performed if there is a problem of stalling.

(iii) Readjustment of the engine idle speed (curb idle and fast idle) may be performed in addition to that performed as scheduled maintenance under paragraph (c) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 rpm or more, or if there is a problem of stalling.

(2) Any other unscheduled vehicle, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement during testing to determine deterioration factors shall be performed only with the advance approval of the Administrator. Such approval will be given if the Administrator:

(i) Has made a preliminary determination that the part failure or system malfunction, or the repair of such failure or malfunction, does not render the vehicle or engine unrepresentative of vehicles or engines in-use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement; and

(ii) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, engine stalling, overheating, fluid leakage, loss of oil pressure, excessive fuel consumption or excessive power loss. The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or vehicle/engine malfunction (*e.g.*, misfiring, stalling, black smoke), or an activation of an audible and/or visible signal, prior to the performance of any maintenance to which such overt indication or signal is relevant under the provisions of this section.

(3) Emission measurement may not be used as a means of determining the need for unscheduled maintenance under paragraph (d)(2) of this section, except under the following conditions:

(i) The Administrator may approve unscheduled maintenance on durability-data vehicles based upon a significant change in emission levels that indicates a vehicle or engine malfunction. In these cases the Administrator may first approve specific diagnostic procedures to identify the source of the problem. The Administrator may further approve of specific corrections to the problem after the problem has been identified. The Administrator may only approve the corrective action after it is determined that:

(A) The malfunction was caused by nonproduction build practices or by a previously undetected design problem,

(B) The malfunction will not occur in production vehicles or engines in-use, and

(C) The deterioration factor generated by the durability-data vehicle or engine will remain unaffected by the malfunction or by the corrective action (*e.g.*, the malfunction was present for only a short period of time before detection, replacement parts are functionally representative of the proper mileage or hours, etc.).

(ii) Following any unscheduled maintenance approved under paragraph (d)(3)(i) of this section, the manufacturer shall perform an after-maintenance emissions test. If the Administrator determines that the after-maintenance emission levels for any pollutant indicates that the deterioration factor is no longer representative of production, the Administrator may disqualify the durability-data vehicle or engine.

(4) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the vehicle/engine unrepresentative of vehicles in-use, the vehicle/engine shall not be used for determining deterioration factors.

(5) Repairs to vehicle components of a durability data vehicle other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(e) *Maintenance on emission data vehicles and engines.* (1) Adjustment of engine idle speed on emission data vehicles may be performed once before the low-mileage/low-hour emission test point. Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on emission data vehicles shall be performed only with the advance approval of the Administrator.

(2) Maintenance on light-duty truck emission-data vehicles selected under § 86.085-24(b)(1) (v) or (vii), and permitted to be tested for purposes of § 86.088-23(c)(1)(ii) under the provisions of § 86.085-24(b)(2), may be performed in conjunction with emission control system modifications at the low-mileage test point, and shall be performed in accordance with the maintenance instructions to be provided to the ultimate purchaser required under § 86.087-38.

(3) Maintenance on those light-duty truck emission-data vehicles selected under § 86.085-24(b)(1)(v) which are not capable of being modified in the field for the purpose of complying with emission standards at an altitude other than that intended by the original design, may be performed in conjunction with the emission control system modifications at the low-mileage test point, and shall be approved in advance by the Administrator.

(4) Repairs to vehicle components of an emission data vehicle other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(f) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets and:

(1) Are used in conjuction with scheduled maintenance on such components, or

(2) Are used subsequent to the identification of a vehicle or engine malfunction, as provided in paragraph (d)(2) of this section for durability data vehicles or in paragraph (e)(1) of this section for emission-data vehicles, or

(3) Unless specifically authorized by the Administrator.

(g)(1) Paragraph (g) of this section applies to light-duty vehicles.

(2) *For durability-data vehicles:* (i) Complete emission tests (§§ 86.106 through 86.145) are required before and after all approved scheduled maintenance which may reasonably be expected to affect emissions. The Administrator may, however, waive these test requirements.

(ii)(A) The manufacturers may optionally perform emission tests before unscheduled maintenance.

(B) Emission tests are required after unscheduled maintenance which may reasonably be expected to affect emissions.

(C) The Administrator may waive the requirement to test after unscheduled maintenance.

(iii) These test data may be submitted weekly to the Administrator, but shall be air posted or delivered within 7 days after completion of the tests, along with a complete record of all pertinent maintenance, including a preliminary engineering report of any malfunction diagnosis and the corrective action taken.

(iv)(A) A complete engineering report shall be delivered to the Administrator with the manufacturer's application for certification, unless requested earlier, in which case it must be delivered within 30 days.

(B) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Administrator in accordance with § 86.088-23.

(h) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Administrator in accordance with § 86.088-23.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10662, Mar. 15, 1985, as amended at 51 FR 24609, July 7, 1986]

§ 86.088-28 Compliance with emission standards.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles.

(2) The applicable exhaust and fuel evaporative emission standards (and family particulate emission limits, as appropriate) of this subpart apply to the emissions of vehicles for their useful life.

(3) Since it is expected that emission control efficiency will change with mileage accumulation on the vehicle, the emission level of a vehicle which has accumulated 50,000 miles will be used as the basis for determining compliance with the standards (or family particulate emission limit, as appropriate).

(4) The procedure for determining compliance of a new motor vehicle with exhaust emission standards (or family particulate emission limit, as appropriate) is as follows, except where specified by paragraph (a)(7) of this section for the Alternative Durability Program:

(i) Separate emission deterioration factors shall be determined from the exhaust emission results of the durability-data vehicle(s) for each engine-system combination. A separate factor shall be established for exhaust HC, exhaust CO, exhaust NO_x, and exhaust particulate (diesel vehicles only) for each engine-system combination. A separate evaporative emission deterioration factor shall be determined for each evaporative emission family-evaporative emission control system combination from the testing conducted by the manufacturer (gasoline-fueled vehicles only).

(A) The applicable results to be used unless excluded by paragraph (a)(4)(i)(A)(*4*) of this section in determining the exhaust emission deterioration factors for each engine-system combination shall be:

(*1*) All valid exhaust emission data from the tests required under § 86.084-26(a)(4) except the zero-mile tests. This shall include the official test results, as determined in § 86.088-29 for all tests conducted on all durability-data vehicles of the combination selected under § 86.085-24(c) (including all vehicles elected to be operated by the manufacturer under § 86.085-24(c)(1)(ii)).

(*2*) All exhaust emission data from the tests conducted before and after the scheduled maintenance provided in § 86.088-25.

(*3*) All exhaust emission data from tests required by maintenance approved under § 86.088-25, in those cases where the Administrator conditioned his approval for the performance of such maintenance on the inclusion of such data in the deterioration factor calculation.

(*4*) The manufacturer has the option of applying an outlier test point procedure to completed durability data within its certification testing program for a given model year. The outlier procedure will be specified by the Administrator. For any pollutant, durability-data test points that are identified as outliers shall not be included in the determination of deterioration factors if the manufacturer has elected this option. The manufacturer shall specify to the Administrator before the certification of the first engine family for that model year, if it intends to use the outlier procedure. The manufacturer may not change procedures after the first engine family of the model year is certified. Where the manufacturer chooses to apply both the outlier procedure and averaging (as allowed under § 86.084-26(a)(6)(i)) to the same data set, the outlier procedure shall be completed prior to applying the averaging procedure.

(B) All applicable exhaust emission results shall be plotted as a function of the mileage on the system, rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The data will be acceptable for use in the calculation of the deterioration factor only if the interpolated 4,000-mile and 50,000-mile points on this line are within the low-altitude standards provided in § 86.087-8. Exceptions to this where data are still acceptable are when a best fit straight line crosses an applicable standard but no data points exceeded the standard, or the best fit straight line crosses an applicable standard with a negative slope (the

4,000-mile interpolated point is higher than the 50,000-mile interpolated point) but the 50,000-mile actual data point is below the standard. A multiplicative exhaust emission deterioration factor shall be calculated for each engine-system combination as follows:

Factor = Exhaust emissions interpolated to 50,000 miles divided by exhaust emissions interpolated to 4,000 miles.

These interpolated values shall be carried out to a minimum of four places to the right of the decimal point before dividing one by the other to determine the deterioration factor. The results shall be rounded to three places to the right of the decimal point in accordance with ASTM E 29-67.

(C) An evaporative emissions deterioration factor (gasoline-fueled vehicles only) shall be determined from the testing conducted as described in § 86.088-21(b)(4)(i), for each evaporative emission family-evaporative emission control system combination to indicate the evaporative emission level at 50,000 miles relative to the evaporative emission level at 4,000 miles as follows:

Factor = Evaporative emission level at 50,000 miles minus the evaporative emission level at 4,000 miles.

The factor shall be established to a minimum of two places to the right of the decimal.

(ii)(A) The official exhaust emission test results for each emission-data vehicle at the selected test point shall be multiplied by the appropriate deterioration factor: *Provided*, That if a deterioration factor as computed in paragraph (a)(4)(i)(B) of this section is less than one, that deterioration factor shall be one for the purposes of this paragraph.

(B) The official evaporative emission test results (gasoline-fueled vehicles only) for each evaporative emission-data vehicle at the selected test point shall be adjusted by addition of the appropriate deterioration factor: *Provided*, That if a deterioration factor as computed in paragraph (a)(4)(i)(C) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(iii) The emissions to compare with the standard (or the family particulate emission limit, as appropriate) shall be the adjusted emissions of paragraphs (a)(4)(ii) (A) and (B) of this section for each emission-data vehicle. Before any emission value is compared with the standard (or the family particulate emission limit, as appropriate), it shall be rounded, in accordance with ASTM E 29-67, to two significant figures. The rounded emission values may not exceed the standard (or the family particulate emission limit, as appropriate).

(iv) Every test vehicle of an engine family must comply with the exhaust emission standards (or the family particulate emission limit, as appropriate), as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(v) Every test vehicle of an evaporative emission family must comply with the evaporative emission standard, as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(5) If a manufacturer chooses to change the level of any family particulate emission limit(s) in the particulate averaging program, compliance with the new limit(s) must be based upon existing certification data.

(6) If a manufacturer chooses to participate in the diesel particulate averaging program, the production-weighted average of the family particulate emission limits of all affected engine families must comply with the particulate standard in § 86.087-8(a)(1)(iv), or the composite particulate standard defined in § 86.085-2, as appropriate, at the end of the production year.

(7) The procedure to determine the compliance of new motor vehicles in the Alternative Durability Program (described in § 86.085-13) is the same as described in paragraphs (a)(4)(iii) through (a)(4)(v) of this section. For the engine families that are included in the Alternative Durability Program, the exhaust emission deterioration factors used to determine compliance shall be those that the Administrator has approved under § 86.085-13(c). The evaporative emission deterioration factor for each evaporative emission family shall be determined and

applied according to paragraph (a)(4) of this section. The procedures to determine the minimum exhaust emissions deterioration factors required under § 86.085–13(d) are as follows:

(i) Separate deterioration factors shall be determined from the exhaust emission results of the durability-data vehicles for each engine family group. A separate factor shall be established for exhaust HC, exhaust CO, and exhaust NOx for each engine family group. The evaporative emission deterioration factor for each evaporative family will be determined and applied in accordance with paragraph (a)(4) of this section.

(ii) The deterioration factors for each engine family group shall be determined by the Administrator using historical durability data from as many as three previous model years. These data will consist of deterioration factors generated by durability-data vehicles representing certified engine families and of deterioration factors from vehicles selected under § 86.085–24(h). The Administrator shall determine how these data will be combined for each engine family group.

(A) The test results to be used in the calculation of each deterioration factor to be combined for each engine family group shall be those test results specified in paragraph (a)(4)(i)(A) of this section.

(B) For each durability-data vehicles selected under § 86.085–24(h), all applicable exhaust emissions results shall be plotted as a function of the mileage on the system rounded to the nearest mile, and the best fit straight lines, fitted by method of least squares, shall be drawn through all these data points. The exhaust deterioration factor for each durability-data vehicles shall be calculated as specified in paragraph (a)(4)(i)(B) of this section.

(C) *Line-crossing.* For the purposes of paragraph (a)(5) of this section, line crossing occurs when either of the interpolated 4,000- and 50,000-mile points of the best fit straight line exceeds the applicable emission standard and at least one applicable data point exceeds the standard.

(*1*) The Administrator will not accept for certification line-crossing data from preproduction durability-data vehicles selected under § 86.085–24(c), § 86.085–24 (h)(2), or (h)(3).

(*2*) The Administrator will not accept for certification line-crossing data from production durability-data vehicles selected under § 86.085–24(h)(1) unless the 4,000-mile test result multiplied by the engine family group deterioration factor does not exceed the applicable emission standards. The deterioration factors used for this purpose shall be those that were used in the certification of the production vehicle. Manufacturers may calculate this product immediately after the 4,000-mile test of the vehicle. If the product exceeds the applicable standards, the manufacturer may, with the approval of the Administrator, discontinue the vehicle and substitute a new vehicle. The manufacturer may continue the original vehicle, but the data will not be acceptable if line crossing occurs.

(b)(1) Paragraph (b) of this section applies to light-duty trucks.

(2) The exhaust and fuel evaporative emission standards (and family particulate emission limits, and family NO_x emission limits, as appropriate) of § 86.088–9 apply to the emissions of vehicles for their useful life.

(3) Since emission control efficiency generally decreases with the accumulation of mileage on the vehicle, deterioration factors will be used in combination with emission-data vehicle test results as the basis for determining compliance with the standards (or family particulate emission limit, or family NO_x emission limit, as appropriate).

(4)(i) Paragraph (b)(4) of this section describes the procedure for determining compliance of a new vehicle with exhaust emission standards (or family particulate emission limit, or family NO_x emission limit, as appropriate), based on deterioration factors supplied by the manufacturers, except where specified by paragraph (b)(5) of this section for the Alternative Durability Program.

(ii) Separate exhaust emission deterioration factors, determined from tests of vehicles, engines, subsystems, or components conducted by the manufacturer, shall be supplied for each engine-system combination. Separate factors shall be established for transient HC, CO, and NO_x, idle CO (gasoline vehicles only), and exhaust particulate (diesel vehicles only).

(iii) For transient HC, CO, and NO_x, idle CO (gasoline vehicles only), and exhaust particulate (diesel vehicles only), the official exhaust emission results for each emission-data vehicle at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(iv) The emission values to compare with the standards (or family emission limits, as appropriate) shall be the adjusted emission values of paragraph (b)(4)(iii) of this section, rounded to the same number of significant figures as contained in the applicable standard in accordance with ASTM E 29–67, for each emission-data engine.

(5)(i) Paragraph (b)(5)(i) of this section applies only to manufacturers electing to participate in the particulate averaging program.

(A) If a manufacturer chooses to change the level of any family particulate emission limit(s), compliance with the new limit(s) must be based upon existing certification data.

(B) The production-weighted average of the family particulate emission limits of all applicable engine families, rounded to two significant figures in accordance with ASTM E 29–67, must comply with the particulate standards in § 86.088–9 (a)(1)(iv) or (d)(1)(iv), or the composite particulate standard defined in § 86.085–2, as appropriate, at the end of the product year.

(ii) Paragraph (b)(5)(ii) of this section applies only to manufacturers electing to participate in the NO_x averaging program.

(A) If a manufacturer chooses to change the level of any family NO_x emission limit(s), compliance with the new limit(s) must be based upon existing certification data.

(B) The production-weighted average of the family NO_x emission limits of all applicable engine families, rounded to two significant figures in accordance with ASTM E 29–67, must comply with the NO_x emission standards of § 86.088–9(a)(1)(iii) (A) or (B), or of § 86.088–9(d)(1)(iii) (A) or (B), or the composite NO_x standard as defined in § 86.088–2, at the end of the product year.

(6) The procedure to determine the compliance of new motor vehicles in the Alternative Durability Program (described in § 86.085–13) is the same as described in paragraphs (b)(4)(iv), (b)(7)(iv) and (b)(8) of this section. For the engine families that are included in the Alternative Durability Program, the exhaust emission deterioration factors used to determine compliance shall be those that the Administrator has approved under § 86.085–13(c). The evaporative emission deterioration factor for each evaporative emission family shall be determined and applied according to paragraph (b)(7) of this section. The procedures to determine the minimum exhaust emissions deterioration factors required under § 86.085–13(d) are as follows:

(i) Separate deterioration factors shall be determined from the exhaust emission results of the durability-data vehicles for each engine family group. A separate factor shall be established for exhaust HC, exhaust CO, and exhaust NO_x for each engine family group. The evaporative emission deterioration factor for each evaporative family will be determined and applied in accordance with paragraph (b)(6) of this section.

(ii) The deterioration factors for each engine family group shall be determined by the Administrator using historical durability data from as many as three previous model years. These data will consist of deterioration factors generated by durability-data vehicles representing certified engine families and of deterioration factors from vehicles selected under § 86.085–24(h). The Administrator shall determine how these data will be combined for each engine family group.

(A) The test results to be used in the calculations of each deterioration factor to be combined for each engine family group shall be those test results specified in paragraph (a)(4)(i)(A) of this section.

(B) For each durability-data vehicle selected under § 86.085-24(h), all applicable exhaust emission results shall be plotted as a function of the mileage on the system rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The exhaust deterioration factor for each durability-data vehicle shall be calculated as specified in paragraph (a)(4)(i)(B) of this section.

(C) *Line crossing.* For the purposes of paragraph (b)(5) of this section, line crossing occurs when either of the interpolated 4,000- and 120,000 mile points of the best fit straight line exceeds the applicable emission standard and at least one applicable data point exceeds the standard.

(*1*) The Administrator will not accept for certification line-crossing data from preproduction durability-data vehicles selected under § 86.085-24(c)(1), or § 86.085-24 (h)(2) or (h)(3).

(*2*) The Administrator will not accept for certification line-crossing data from production durability-data vehicles selected under § 86.085-24(h)(1) unless the 4,000-mile test result multiplied by the engine family group deterioration factor does not exceed the applicable emission standard. The deterioration factors used for this purpose shall be those that were used in the certification of the production vehicle. Manufacturers may calculate this product immediately after the 4,000-mile test of the vehicle. If the product exceeds the applicable standard, the manufacturer may, with the approval of the Administrator, discontinue the vehicle and substitute a new vehicle. The manufacturer may continue the original vehicle, but the data will not be acceptable if line crossing occurs.

(7)(i) Paragraph (b)(7) of this section describes the procedure for determining compliance of a new vehicle with fuel evaporative emission standards. The procedure described here shall be used for all vehicles in all model years.

(ii) The manufacturer shall determine, based on testing described in § 86.088-21(b)(4)(i), and supply an evaporative emission deterioration factor for each evaporative emission family-evaporative emission control system combination. The factor shall be calculated by subtracting the emission level at the selected test point from the emission level at the useful life point.

(iii) The official evaporative emission test results for each evaporative emission-data vehicle at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission value to compare with the standards shall be the adjusted emission value of paragraph (b)(7)(iii) of this section rounded to two significant figures in accordance with ASTM E 29-67 for each evaporative emission-data vehicle.

(8) Every test vehicle of an engine family must comply with all applicable standards (and family particulate emission limits, and family NO$_x$ emission limits, as appropriate), as determined in paragraphs (b)(4)(iv) and (b)(7)(iv) of this section, before any vehicle in that family will be certified.

(c)(1) Paragraph (c) of this section applies to heavy-duty engines.

(2) The exhaust emission standards for gasoline-fueled engines in § 86.088-10 or for diesel engines in § 86.088-11 apply to the emissions of engines for their useful life.

(3) Since emission control efficiency generally decreases with the accumulation of service on the engine, deterioration factors will be used in combination with emission-data engine test results as the basis for determining compliance with the standards.

(4)(i) Paragraph (c)(4) of this section describes the procedure for determining compliance of an engine with emission standards, based on deterioration factors supplied by the manufacturer.

(ii) Separate exhaust emission deterioration factors, determined from tests of engines, subsystems, or components conducted by the manufacturer, shall be supplied for each engine-system combination. For gasoline engines, separate factors shall be established for transient HC, CO, and NO$_x$, and for idle CO, for those engines utilizing aftertreatment technology (*e.g.*, catalytic converters). For diesel engines, separate factors shall be established for transient HC, CO, NO_x, and exhaust particulate. For diesel smoke testing, separate factors shall also be established for the acceleration mode (designated as "A"), the lugging mode (designated as "B"), and peak opacity (designated as "C").

(iii)(A) Paragraph (c)(4)(iii)(A) of this section applies to gasoline-fueled heavy-duty engines.

(*1*) *Gasoline-fueled heavy-duty engines not utilizing aftertreatment technology (e.g., catalytic converters).* For transient HC, CO, and NO_x, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(*2*) *Gasoline-fueled heavy-duty engines utilizing aftertreatment technology (e.g., catalytic converters).* For transient HC, CO, and NO_x, and for idle CO, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(B) Paragraph (c)(4)(iii)(B) of this section applies to diesel heavy-duty engines.

(*1*) *Diesel heavy-duty engines not utilizing aftertreatment technology e.g., particulate traps).* For transient HC, CO, NO_x, and particulate, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(*2*) *Diesel heavy-duty engines utilizing aftertreatment technology (e.g., particulate traps).* For transient HC, CO, NO_x, and particulate, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(*3*) For acceleration smoke ("A"), lugging smoke ("B"), and peak smoke ("C"), the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission values to compare with the standards (or family emission limits, as appropriate) shall be the adjusted emission values of paragraph (c)(4)(iii) of this section, rounded to the same number of significant figures as contained in the applicable standard in accordance with ASTM E 29-67, for each emission-data engine.

(5)—(6) [Reserved]

(7) Every test engine of an engine family must comply with all applicable standards, as determined in paragraph (c)(4)(iv) of this section, before any engine in that family will be certified.

(d)(1) Paragraph (d) of this section applies to gasoline-fueled heavy-duty vehicles.

(2) The applicable fuel evaporative emission standard in § 86.088-10 applies to the emissions of vehicles for their useful life.

(3)(i) For vehicles with a GVWR of up to 26,000 pounds, because it is expected that emission control efficiency will change during the useful life of the vehicle, an evaporative emission deterioration factor shall be determined from the testing described in § 86.088-23(b)(3) for each evaporative emission family-evaporative emission control system combination to indicate the evaporative emission control system deterioration during the useful life of the vehicle (minimum 50,000 miles). The factor shall be established to a minimum of two places to the right of the decimal.

(ii) For vehicles with a GVWR of greater than 26,000 pounds, because it is expected that emission control efficiency will change during the useful life of the vehicle, each manufactur er's statement as required in § 86.088-23(b)(4)(ii) shall include, in accordance with good engineering practice, consideration of control system deterioration.

(4) The evaporative emission test results, if any, shall be adjusted by the addition of the appropriate deterioration factor: *Provided,* That if the deterioration factor as computed in paragraph (d)(3) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(5) The emission level to compare with the standard shall be the adjusted emission level of paragraph (d)(4) of this section. Before any emission value is compared with the standard, it shall be rounded, in accordance with ASTM E 29-67, to two significant figures. The rounded emission values may not exceed the standard.

(6) Every test vehicle of an evaporative emission family must comply with the evaporative emission standard, as determined in paragraph (d)(5) of this section, before any vehicle in that family may be certified.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10665, Mar. 15, 1985, as amended at 51 FR 24609, July 7, 1986]

§ 86.088-29 Testing by the Administrator.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(2) The Administrator may require that any one or more of the test vehicles be submitted to him, at such place or places as he may designate, for the purposes of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test vehicle, the results of that test shall, unless subsequently invalidated by the Administrator, comprise the official data for the vehicle at the prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards (or family particulate emission limits, or family NO_x emission limits, as appropriate).

(ii) Whenever the Administrator does not conduct a test on a test vehicle at a test point, the manufacturer's test data will be accepted as the official data for that point: *Provided,* That if the Administrator makes a determination based on testing under paragraph (a)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer. *And further provided,* That if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provisions of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission or further information. If the manufacturer conducts more than one test on a vehicle, as authorized under § 86.084-26(a)(3)(i)(A) or (b)(4)(i)(A), the data from the last test in that series of tests on that vehicle, will constitute the official data.

(iii)(A)(*1*) The Administrator may adjust or cause to be adjusted any adjustable parameter of an emission data vehicle or engine which the Administrator has determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.085-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.085-22(e)(3)(i), prior to the performance of any tests to determine whether such vehicle or engine conforms to applicable emission standards, including tests performed by the manufacturer under § 86.088-23(c)(1). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before it accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. The Administrator, in making or specifying such adjustments, will consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use light-duty vehicles or light-duty trucks. In determining likelihood, the Administrator will consider factors such as, but not limited to, the effect of the adjustment on vehicle performance characteristics and surveillance information from similar in-use vehicles.

(*2*) For those vehicles or engine parameters which the Administrator has not determined to be subject to adjustment during certification and Selective Enforcement Audit testing in accordance with § 86.085-22(e)(1), the emission-data vehicle presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the vehicle label (see § 86.088-35(a)(1)(iii)(D) or (a)(2)(iii)(D)) as specified in the application for certification. If the Administrator determines that a vehicle is not within such tolerances, the vehicle will be adjusted, at the facility designated by the Administrator, prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the vehicle will be used as an emission-data vehicle.

(B) If the Administrator determines that the test data developed on an emission-data vehicle under paragraph (a)(3)(i) of this section would cause that vehicle to fail due to excessive 4,000-mile emissions or by application of the appropriate deterioration factor, then the following procedure shall be observed:

(*1*) The manufacturer may request a retest. Before the retest, those vehicle or engine parameters which the Administrator has not determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.085-22(e)(1) may be readjusted to manufacturer's specification, if these adjustments were made incorrectly prior to the first test. The Administrator may adjust or cause to be adjusted any parameter which the Administrator has determined to be subject to adjustment to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.085-22(e)(3)(i). Other maintenance or repairs may be performed in accordance with § 86.088-25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The vehicle will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data vehicle.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (a)(2) of this section to enable the Administrator to determine whether an emission-data vehicle would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (a)(3)(iii) (A) and (B) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the vehicle from the test premises.

(b)(1) Paragraph (b) of this section applies to heavy-duty engines.

(2) The Administrator may require that any one or more of the test engines be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's fa-

cility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test engine the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the engine at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on a test engine at a test point, the manufacturer's test data will be accepted as the official data for that test point: *Provided*, That if the Administrator makes a determination based on testing under paragraph (b)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *And further provided*, That if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission of further information.

(iii)(A)(*1*) The Administrator may adjust or cause to be adjusted any adjustable parameter of an emission-data engine which the Administrator has determined to be subject to adjustment for certification testing in accordance with § 86.085-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.085-22(e)(3)(i), prior to the performance of any tests to determine whether such engine conforms to applicable emission standards, including tests performed by the manufacturer under § 86.088-23(c)(2). The Administrator, in making or specifying such adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use heavy-duty engines. In determining likelihood, the Administrator may consider factors such as, but not limited to, the effect of the adjustment on engine performance characteristics and surveillance information from similar in-use engines.

(*2*) For those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.085-22(e)(1), the emission-data engine presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the engine label (see § 86.088-35(a)(3)(iii)) as specified in the application for certification. If the Administrator determines that an engine is not within such tolerances, the engine shall be adjusted at the facility designated by the Administrator prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the engine shall be used as an emission-data engine.

(B) If the Administrator determines that the test data developed under paragraph (b)(3)(iii)(A) of this section would cause the emission-data engine to fail due to excessive 125-hour emission values or by the application of the appropriate deterioration factor, then the following procedure shall be observed:

(*1*) The manufacturer may request a retest. Before the retest, those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.085-22(e)(1) may be readjusted to the manufacturer's specifications, if these adjustments were made incorrectly prior to the first test. The Administrator may adjust or cause to be adjusted any parameter which the Administrator has determined to be subject to adjustment in accordance with § 86.085-22(e)(3)(i). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before if accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. Other maintenance or repairs may be performed in accordance with § 86.088-25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The engine will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data engine.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (b)(2) of this section to enable the Administrator to determine whether an emission-data engine would fail, the manufacturer may request a retest in accordance with the provisions of paragraph (b)(3)(iii)(B) (1) and (2) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the engine from the test premises.

(c)(1) Paragraph (c) of this section applies to gasoline-fueled heavy-duty vehicles.

(2) The Administrator may require that any one or more of the evaporative emission family-system combinations included in the manufacturer's statement(s) of compliance be installed on an appropriate vehicle and such vehicle be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on an evaporative emission family-system combination the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the evaporative emission family-system combination and the manufacturer's data, analyses, etc., shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on an evaporative emission family-system combination, the manufacturer's test data will be accepted as the official data: *Provided,* That if the Administrator makes a determination, based on testing under paragraph (c)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *And further provided,* That if the Administrator has reasonable basis to believe that any test data, analyses, or other information submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept those data, analyses, etc., as the official data pending retesting or submission of further information.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10672, Mar. 15, 1985]

§ 86.088-30 Certification.

(a)(1)(i) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 86.078-7(c), and any other pertinent data or information, the Administrator determines that a test vehicle(s) (or test engine(s)) meet(s) the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such vehicle(s) (or engine(s)) except in cases covered by paragraphs (a)(1) (ii) and (c) of this section.

(ii) *Gasoline-fueled heavy-duty vehicles.* If, after a review of the statement(s) of compliance submitted by the manufacturer under § 86.088-23(b)(4) and any other pertinent data or information, the Administrator determines that the requirements of the Act and this subpart have been met, he will issue one certificate of conformity per manufacturer with respect to the evaporative emission family(s) covered by such statement(s) except in cases covered by paragraph (c) of this section.

(2) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary or appropriate to assure that any new motor vehicle (or new motor vehicle engine) covered by the certificate will meet the requirements of the Act and of this part.

(3)(i) One such certificate will be issued for each engine family. For gasoline-fueled light-duty vehicles and light-duty trucks, one such certificate will be issued for each engine family-evaporative emission family combination.

(A) *Light-Duty Vehicles.* Each certificate will certify compliance with no more than one set of standards (or one family particulate emission limit, as appropriate).

(B) *Light-Duty Trucks.* Each certificate will certify compliance with no more than one set of standards (or one family particulate emission limit, or one family NO_x emission limit, as appropriate), except for low-altitude standards and high-altitude standards. The certificate shall state that it covers vehicles sold or delivered to an ultimate purchaser for principal use at a designated high-altitude location only if the vehicle conforms in all material respects to the design specifications that apply to those vehicles described in the application for certification at high altitude.

(ii) For gasoline-fueled heavy-duty vehicles, one such certificate will be issued for each manufacturer and will certify compliance for those vehicles previously identified in that manufacturer's statement(s) of compliance as required in § 86.088-23(b)(4) (i) and (ii).

(iii) For diesel light-duty vehicles and light-duty trucks included in the particulate averaging program, the manufacturer may at any time during production elect to change the level of any family particulate emission limit by demonstrating compliance with the new limit as described in §§ 86.088-28(a)(6) and 86.088-28(b)(5)(i). New certificates issued under this paragraph will be applicable only for vehicles produced subsequent to the date of issuance.

(iv) For light-duty trucks included in the NO_x averaging program, the manufacturer may at any time during production elect to change the level of any family NO_x emission limit by demonstrating compliance with the new limit as described in § 86.088-28(b)(5)(ii). New certificates issued under this paragraph will be applicable only for vehicles produced subsequent to the day of issue.

(4)(i) The adjustment or modification of any light-duty truck in accordance with instructions provided by the manufacturer for the altitude where the vehicle is principally used will not be considered a violation of Section 203(a)(3) of the Clean Air Act.

(ii) A violation of Section 203(a)(1) of the Clean Air Act occurs when a manufacturer sells or delivers to an ultimate purchaser any light-duty vehicle or light-duty truck, subject to the regulations under the Act, under any of the conditions specified in the remainder of this paragraph.

(A) When a light-duty vehicle or light-duty truck is not configured to meet high-altitude requirements:

(*1*) At a designated high-altitude location, unless such manufacturer has reason to believe that such vehicle will not be sold to an ultimate purchaser for principal use at a designated high-altitude location; or

(*2*) At a location other than a designated high-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated high-altitude location.

(B) When a light-duty vehicle is not configured to meet low-altitude requirements, as provided in § 86.087-8(i):

(*1*) At a designated low-altitude location, unless such manufacturer has reason to believe that such vehicle will not be sold to an ultimate purchaser for principal use at a designated low-altitude location; or

(*2*) At a location other than a designated low-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated low-altitude location.

(iii) A manufacturer shall be deemed to have reason to believe that a light-duty vehicle that has been exempted from compliance with emission standards at high altitude, or a light-duty truck which is not configured to meet high-altitude requirements, will not be sold to an ultimate purchaser for principal use at a designated high-altitude location if the manufacturer has informed its dealers and field representatives about the terms of these high-altitude regulations, has not caused the improper sale itself, and has taken reasonable action which shall include, but not be limited to, either paragraph (a)(4)(iii) (A) or (B), and (a)(4)(iii)(C) of this section:

(A) Requiring dealers in designated high-altitude locations to submit written statements to the manufacturer signed by the ultimate purchaser that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location; requiring dealers in counties contiguous to designated high-altitude locations to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location; and for each sale or delivery of fleets of ten or more such vehicles in a high-altitude location or in counties contiguous to high-altitude locations, requiring either the selling dealer or the delivering dealer to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location. In addition, the manufacturer will make available to EPA, upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold), sales, warranty, or other information pertaining to sales of vehicles by the dealers described above maintained by the manufacturer in the normal course of business relating to the altitude configuration of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of low-altitude vehicles by high-altitude dealers, or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser for principal use at a designated high-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a State or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser residing in a designated high-altitude location, or based on information obtained pursuant to paragraph (a)(4)(iii) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and, where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet high-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(iv) A manufacturer shall be deemed to have reason to believe that a light-duty vehicle which has been exempted from compliance with emission standards at low-altitude, as provided in § 86.087–8(i), will not be sold to an ultimate purchaser for principal use at a designated low-altitude location if the manufacturer has informed its dealers and field representatives about the terms of these high-altitude regulations, has not caused the improper sale itself, and has taken reasonable action which shall include, but not be limited to, either paragraph (a)(4)(iv) (A) or (B), and (a)(4)(iv)(C) of this section:

(A) Requiring dealers in designated low-altitude locations to submit written statements to the manufacturer signed by the ultimate purchaser that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated low-altitude location; requiring dealers in counties contiguous to designated low-altitude locations to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated low-altitude location, that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated low-altitude location; and for each sale or delivery of fleets of ten or more such vehicles in a low-altitude location or in counties contiguous to low-altitude locations, requiring either the selling dealer or the delivering dealer to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated low-altitude location, that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated high-altitude location. In addition, the manufacturer will make available to EPA, upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold), sales, warranty, or other information pertaining to sales of vehicles by the dealers described above maintained by the manufacturer in the normal course of business relating to the altitude configuration of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of high-altitude vehicles by low-altitude dealers, or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the low-altitude requirements to an ultimate purchaser for principal use at a designated low-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a state or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the low-altitude requirements to an ultimate purchaser residing in a designated low-altitude location, or based on information obtained pursuant to paragraph (a)(4)(iv) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and, where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet low-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(5)(i) For the purpose of paragraph (a) of this section, a "designated high-altitude location" is any county which has substantially all of its area located above 1,219 meters (4,000 feet) and:

(A) Requested an extension past the attainment date of December 31, 1982, for compliance with either the National Ambient Air Quality Standards for carbon monoxide or ozone, as indicated in Part 52 (Approval and Promulgation of Implementation Plans) of this title; or

(B) Is the same state as a county designated as a high-altitude location according to paragraph (a)(5)(i)(A) of this section.

(ii) The designated high-altitude locations defined in paragraph (a)(5)(i) of this section are listed below:

STATE OF COLORADO

Adams
Alamosa
Arapahoe
Archuleta
Boulder
Chaffee
Cheyenne
Clear Creek
Conejos
Costilla
Crowley
Custer
Delta
Denver
Dolores
Douglas
Eagle
Elbert
El Paso
Fremont
Garfield
Gilpin
Grand
Gunnison
Hinsdale
Huerfano
Jackson
Jefferson
Kit Carson
Lake
La Plata
Larimer
Las Animas
Lincoln
Mesa
Mineral
Moffat
Montezuma
Montrose
Morgan
Otero
Ouray
Park
Pitkin
Pueblo
Rio Blanco
Rio Grande
Routt
Saguache
San Juan
San Miguel
Summit
Teller
Washington
Weld

STATE OF NEVADA

Carson City
Douglas
Elko
Esmeralda
Eureka
Humboldt
Lander
Lincoln
Lyon
Mineral
Nye
Pershing
Storey
Washoe
White Pine

STATE OF NEW MEXICO

Bernalillo
Catron
Colfax
Curry
De Baca
Grant
Guadalupe
Harding
Hidalgo
Lincoln
Los Alamos
Luna
McKinley
Otero
Mora
Rio Arriba
Roosevelt
Sandoval
San Juan
San Miguel
Santa Fe
Sierra
Socorro
Taos
Torrance
Union
Valencia

STATE OF UTAH

Beaver
Box Elder
Cache
Carbon
Daggett
Davis
Duchesne
Emery
Garfield
Grand
Iron
Juab
Kane
Millard
Morgan
Piute
Rich
Salt Lake
San Juan
Sanpete
Sevier
Summit
Tooele
Uintah
Utah
Wasatch
Wayne
Weber

(iii) For the purpose of paragraph (a) of this section, a "designated low-altitude location" is any county which has substantially all of its area located below 1,219 meters (4,000 feet).

(iv) The designated low-altitude locations so defined include all counties in the United States which are not listed in either paragraph (a)(5)(ii) of this section or in the list below:

STATE OF ARIZONA

Apache
Cochise
Coconino
Navajo
Yavapai

STATE OF IDAHO

Bannock
Bear Lake
Bingham
Blaine
Bonneville
Butte
Camas
Caribou
Cassia
Clark
Custer
Franklin
Fremont
Jefferson
Lemhi
Madison
Minidoka
Oneida
Power
Teton
Valley

STATE OF MONTANA

Beaverhead
Deer Lodge
Gallatin
Jefferson
Judith Basin
Madison
Meagher
Park
Powell
Silver Bow
Wheatland

STATE OF NEBRASKA

Banner
Cheyenne
Kimball
Sioux

STATE OF OREGON

Harney
Klamath
Lake

STATE OF TEXAS

Jeff Davis
Hudspeth
Parmer

STATE OF WYOMING

Albany
Campbell
Carbon
Converse
Fremont
Goshen
Hot Springs
Johnson
Laramie
Lincoln
Natrona
Niobrara
Park
Platte
Sublette
Sweetwater
Teton
Uinta
Washakie
Weston

(6) Catalyst-equipped vehicles, otherwise covered by a certificate, which are driven outside the United States, Canada, and Mexico will be presumed to have been operated on leaded gaso ine resulting in deactivation of the catalysts. If these vehicles are imported or offered for importation without retrofit of the catalyst, they will be considered not to be within the coverage of the certificate unless included n a catalyst control program operated y a manufacturer or a United States Government agency and approved by he Administrator.

(7) For incomplete light-duty trucks, certificate covers only those new otor vehicles which, when completed y having the primary load-carrying evice or container attached, conform o the maximum curb weight and rontal area limitations described in he application for certification as reuired in § 86.088-21(d).

(8) For heavy-duty engines, a certifiate covers only those new motor vehie engines installed in heavy-duty veicles which conform to the minimum oss vehicle weight rating, curb eight, or frontal area limitations for eavy-duty vehicles described in 86.082-2.

(9) For incomplete gasoline-fueled eavy-duty vehicles a certificate vers only those new motor vehicles hich, when completed, conform to e nominal maximum fuel tank cacity limitations as described in the plication for certification as reired in § 86.088-21(e).

10) For diesel light-duty vehicles d diesel light-duty truck familes hich are included in particulate avering program the manufacturer's oduction-weighted average of the rticulate emission limits of all gine families in a participating class classes shall not exceed the applicable diesel particulate standard, or the composite particulate standard defined in § 86.085-2, as appropriate, at the end of the model year, as determined in accordance with 40 CFR Part 86. The certificate shall be void *ab initio* for those vehicles causing any exceedance of the particulate standard.

(11) For light-duty truck families which are included in the NO_x averaging program, the manufacturer's production-weighted average of the NO_x emission limits of all such engine families shall not exceed the applicable light-duty truck NO_x standard, or the composite NO_x standard defined in § 86.088-2, as appropriate, at the end of the model year, as determined in accordance with 40 CFR Part 86. The certificate shall be void *ab initio* for those vehicles causing any exceedance of the NO_x standard.

(b)(1) The Administrator will determine whether a vehicle (or engine) covered by the application complies with applicable standards (or family particulate emission limit, or family NO_x emission limit, as appropriate) by observing the following relationships:

(i) *Light-duty vehicles.* (A) The durability-data vehicle(s) selected under § 86.085-24(c)(1)(i) shall represent all vehicles of the same engine-system combination.

(B) The emission-data vehicle(s) selected under § 86.085-24(b)(1) (ii) through (iv) shall represent all vehicles of the same engine-system combination as applicable.

(C) The emission-data vehicle(s) selected under § 86.085-24(b)(1)(vii) (A) and (B) shall represent all vehicles of the same evaporative control system within the evaporative family.

(ii) *Light-duty trucks.* (A) The emission-data vehicle(s) selected under § 86.085-24(b)(1)(ii), shall represent all vehicles of the same engine-system combination as applicable.

(B) The emission-data vehicle(s) selected under § 86.085-24(b)(1)(vii) (A) and (B) shall represent all vehicles of the same evaporative control system within the evaporative family.

(C) The emission-data vehicle(s) selected under § 86.085-24(b)(1)(v) shall represent all vehicles of the same engine-system combination as applicable.

(D) The emission-data vehicle(s) selected under § 86.085–24(b)(1)(viii) shall represent all vehicles of the same evaporative control system within the evaporative emission family, as applicable.

(iii) *Heavy-duty engines.* (A) A gasoline-fueled emission-data test engine selected under § 86.085–24(b)(2)(iv) shall represent all engines in the same family of the same engine displacement-exhaust emission control system combination.

(B) A gasoline-fueled emission-data test engine selected under § 86.085–24(b)(2)(iii) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(C) A diesel emission-data test engine selected under § 86.085–24(b)(3)(ii) shall represent all engines in the same engine-system combination.

(D) A diesel emission-data test engine selected under § 86.085–24(b)(3)(iii) shall represent all engines of that emission control system at the rated fuel delivery of the test engine.

(iv) *Gasoline-fueled heavy-duty vehicles.* A statement of compliance submitted under § 86.088–23(b)(4) (i) or (ii) shall represent all vehicles in the same evaporative emission family-evaporative emission control system combination.

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the vehicles (or engines) belonging to an engine family or engine family-evaporative emission family combination (as applicable), all of which comply with all applicable standards (or family emission limits, as appropriate).

(3) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to § 86.088–29, data or information derived from any inspection carried out under § 86.078–7(c) or any other pertinent data or information, the Administrator determines that one or more test vehicles (or test engines) of the certification test fleet do not meet applicable standards (or family particulate emission limits, as appropriate), he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determination and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078–6 with respect to such issue.

(4) For light-duty vehicles and light-duty trucks the manufacturer may, at its option, proceed with any of the following alternatives with respect to an emission-data vehicle determined not in compliance with all applicable standards (or family particulate emission limits or family NO_x emission limits, as appropriate) for which it was tested:

(i) Request a hearing under § 86.078–6; or

(ii) Remove the vehicle configuration (or evaporative vehicle configuration as applicable) which failed, from his application;

(A) If the failed vehicle was tested for compliance with exhaust emission standards (or the family particulate emission limit, or the family NO_x emission limit, as appropriate) only: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle to be tested for exhaust emission compliance only.

(B) If the failed vehicle was tested for compliance with both exhaust and evaporative emission standards: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle which will be tested for compliance with both exhaust and evaporative emission standards. If one vehicle cannot be selected in accordance with the selection criteria em-

ployed in selecting the failed vehicle,
hen two vehicles may be selected (*i.e.*,
one vehicle to satisfy the exhaust
emission vehicle selection criteria and
one vehicle to satisfy the evaporative
emission vehicle selection criteria).
The vehicle selected to satisfy the ex-
haust emission vehicle selection crite-
ia will be tested for compliance with
xhaust emission standards only. The
ehicle selected to satisfy the evapora-
ive emission vehicle selection criteria
will be tested for compliance with
oth exhaust and evaporative emission
tandards; or

(iii) Remove the vehicle configura-
ion (or evaporative vehicle configura-
on, as applicable) which failed from
he application and add a vehicle
onfiguration(s) (or evaporative vehi-
e configuration(s), as applicable) not
reviously listed. The Administrator
ay require, if applicable, that the
iled vehicle be modified to the new
ngine code (or evaporative emission
ode, as applicable) and demonstrate
y testing that it meets applicable
andards (or the family particulate
nission limit, or the family NO$_x$ emis-
on limit, as appropriate) for which it
as originally tested. In addition, the
dministrator may select, in accord-
nce with the vehicle selection criteria
ven in § 86.085-24(b), a new emission-
ta vehicle or vehicles. The vehicles
lected to satisfy the exhaust emis-
on vehicle selection criteria will be
sted for compliance with exhaust
nission standards (or the family par-
ulate emission limit, or the family
O$_x$ emission limit, as appropriate)
ly. The vehicles selected to satisfy
e evaporative emission vehicle selec-
n criteria will be tested for compli-
ce with both exhaust and evapora-
e emission standards (or the family
rticulate emission limit, or the
nily NO$_x$ emission limit, as appropri-
e); or

iv) Correct a component or system
lfunction and show that with a cor-
tly functioning system or compo-
nt the failed vehicle meets applica-
standards (or the family particu-
e emission limit, or the family NO$_x$
ission limit, as appropriate) for
ich it was originally tested. The Ad-
nistrator may require a new emis-
n-data vehicle, of identical vehicle
configuration (or evaporative vehicle configuration, as applicable) to the failed vehicle, to be operated and tested for compliance with the applicable standards (or the family particulate emission limit, or the family NO$_x$ emission limit, as appropriate) for which the failed vehicle was originally tested.

(5) For heavy-duty engines the manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test engine(s) determined not in compliance with applicable standards:

(i) Request a hearing under § 86.078-6; or

(ii) Delete from the application for certification the engines represented by the failing test engine. (Engines so deleted may be included in a later request for certification under § 86.079-32.) The Administrator may then select in place of each failing engine an alternate engine chosen in accordance with selection criteria employed in selecting the engine that failed; or

(iii) Modify the test engine and demonstrate by testing that it meets applicable standards. Another engine which is in all material respects the same as the first engine, as modified, may then be operated and tested in accordance with applicable test procedures.

(6) If the manufacturer does not request a hearing or present the required data under paragraph (b)(4) or (b)(5) of this section (as applicable) of this section, the Administrator will deny certification.

(c)(1) Notwithstanding the fact that any certification vehicle(s) (or certification engine(s)) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such vehicle(s) (or engine(s)) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof;

(ii) The manufacturer renders inaccurate any test data which he submits pertaining thereto or otherwise circumvents the intent of the Act, or of this part with respect to such vehicle (or engine);

(iii) Any EPA Enforcement Officer is denied access on the terms specified in § 86.078-7(c) to any facility or portion thereof which contains any of the following:

(A) The vehicle (or engine);

(B) Any components used or considered for use in its modification or buildup into a certification vehicle (or certification engine);

(C) Any production vehicle (or production engine) which is or will be claimed by the manufacturer to be covered by the certificate;

(D) Any step in the construction of a vehicle (or engine) described in paragraph (c)(iii)(C) of this section;

(E) Any records, documents, reports, or histories required by this part to be kept concerning any of the above;

(iv) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 86.078-7(c)) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(2) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraph (c)(1) (i), (ii), (iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void *ab initio*.

(4) In any case in which certification of a vehicle (or engine) is proposed to be withheld, denied, revoked, or suspended under paragraph (c)(1) (iii) or (iv) of this section, and in which the Administrator has presented to the manufacturer involved, reasonable evidence that a violation of § 86.078-7(c) in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle (or engine) in question was not involved in the violation to a degree that would warrant withholding denial, revocation, or suspension of certification under either paragraph (c)(1) (iii) or (iv) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(5) Any revocation or suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.078-6 hereof.

(ii) Extend no further than to forbid the introduction into commerce of vehicles (or engines) previously covered by the certification which are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes the certification invalid *ab initio*.

(6) The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Administrator under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with § 86.078-6. If the Administrator finds, after a review of the request and supporting data, that the request raises a substantial factual issue, he will grant the request with respect to such issue.

(d)(1) *For light-duty vehicles.* Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.603; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.603; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.609; or

(iv) The manufacturer renders inaccurate any test data which he submits pursuant to § 86.609; or

(v) Any EPA Enforcement Officer is denied access to a facility on the terms specified in § 86.606; or

(vi) Any EPA Enforcement Officer is denied the opportunity on the terms specified in § **86.606**, to:

(A) Monitor vehicle selection pursuant to § 86.607, or

(B) Select vehicles for testing pursuant to § 86.607; or

(C) Monitor vehicle testing performed to satisfy any of the requirements of this part; or

(vii) Any EPA Enforcement Officer is denied "reasonable assistance" as defined in § 86.606 in examining any of the items listed in that section; or

(viii) The manufacturer refuses to comply with the requirements of §§ 86.604(a), 86.605, and 86.607, 86.608, 86.610, or § 86.611.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraph (d)(1) (i), (ii), or (viii) of this section where such refusal is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but not be limited to, any uncontrollable factors which result in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturer to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanctions of suspending a certificate may be imposed for the reasons in paragraph (d)(1) (iii), (iv), (v), (vi), or (vii) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a vehicle is proposed to be suspended under paragraph (d)(1) (v), (vi), or (vii) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.606 in fact occurred, the manufacturer, if he wishes to contend that even though the violation occurred, the vehicle configuration or engine family in question was not involved in the violation to the degree that would warrant suspension of certification under either paragraph (d)(1) (v), (vi), or (vii) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (d)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.613 hereof, and

(ii) Not apply to vehicles no longer in the hands of the manufacturer.

(e) *For light-duty trucks and heavy-duty engines.* (1) Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle or engine configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.1003; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.1003; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.1009; or

(iv) The manufacturer renders inaccurate any test data submitted pursuant to § 86.1009; or

(v) Any EPA Enforcement Officer is denied the opportunity to conduct activities related to entry and access as authorized in § 86.1006 of this part and in a warrant or court order presented to the manufacturer or the party in charge of a facility in question; or

(vi) EPA Enforcement Officers are unable to conduct activities related to entry and access as authorized in § 86.1006 of this part because a manufacturer has located a facility in a foreign jurisdiction where local law prohibits those activities; or

(vii) The manufacturer refuses to or in fact does not comply with the requirements of §§ 86.1004(a), 86.1005, 86.1007, 86.1008, 86.1010, 86.1011, or 86.1013.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraphs (e)(1) (i), (ii), or (vii) of this section where such refusal or denial is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but are not limited to, any uncontrollable factors which result in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturers to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanction of suspending a certificate may be imposed for the reasons outlined in paragraph (e)(1) (iii), (iv), or (v) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a light-duty truck or heavy-duty engine is proposed to be suspended under paragraph (e)(1)(v) of this section and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.1006 in fact occurred, if the manufacturer wishes to contend that, although the violation occurred, the vehicle or engine configuration or engine family in question was not involved in the violation to a degree that would warrant suspension of certification under paragraph (e)(1)(v) of this section, he shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (e)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014, and

(ii) Not apply to vehicles or engines no longer in the hands of the manufacturer.

(7) Any voiding of a certificate of conformity under paragraph (e)(4) of this section shall be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10677, Mar. 15, 1985]

§ 86.088–35 Labeling.

(a) The manufacturer of any motor vehicle (or motor vehicle engine) subject to the applicable emission standards (and family particulate emission limits and family NO_x emission limits, as appropriate) of this subpart shall, at the time of manufacture, affix a permanent legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles (or engines) available for sale to the public and covered by a certificate of conformity under § 86.088–30(a).

(1) *Light-duty vehicles.* (i) A permanent, legible label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches), engine, family identification and evaporative family identification;

(D) Engine tune-up specifications and adjustments, as recommended by the manufacturer in accordance with the applicable emission standards (or family particulate emission limit, as applicable), including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and valve (*e.g.*, idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable), as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tune-up and what accessories (*e.g.*, air conditioner), if any, should be in operation;

(E) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to light-duty vehicles;

(F) For vehicles which are part of the diesel particulate averaging program, the family particulate emission limit to which the vehicle is certified;

(G) For vehicles that have been exempted from compliance with the emission standards at high altitude, as specified in § 86.087-8(h),

(*1*) A highlighted statement (*e.g.*, underscored or boldface letters) that the vehicle is certified to applicable emission standards at low altitude only,

(*2*) A statement that the vehicle's unsatisfactory performance under high-altitude conditions makes it unsuitable for principal use at high altitude, and

(*3*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart V do not apply when the vehicle is tested at high altitude, and

(H) For vehicles that have been exempted from compliance with the emission standards at low altitude, as specified in § 86.087-8(i),

(*1*) A highlighted statement (*e.g.*, underscored or boldface letters) that the vehicle is certified to applicable emission standards at high altitude only, and

(*2*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart V do not apply when the vehicle is tested at low altitude.

(2) *Light duty trucks and heavy-duty vehicles optionally certified in accordance with the light-duty truck provisions.* (i) A legible, permanent label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label.

(A) The label heading: Important Vehicle Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family identification;

(D) Engine tune-up specifications and adjustments, as recommended by the manufacturer in accordance with the applicable emission standards (or family particulate limit, as appropriate), including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (*e.g.*, idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable), as well as other parameters deemed necessary by the manu-

best copy available

facturer. These specifications should indicate the proper transmission position during tune-up and what accessories (*e.g.*, air conditioner), if any, should be in operation. If adjustments or modifications to the vehicle are necessary to insure compliance with emission standards (or family particulate limit, or family NO_x emission limit, as appropriate) at either high or low altitude, the manufacturer shall either include the instructions for such adjustments on the label, or indicate on the label where instructions for such adjustments may be found. The label shall indicate whether the engine tune-up or adjustment specifications are applicable to high altitude, low altitude or both;

(E)(*1*) *Light-duty trucks* one of the prominent statements, as applicable:

(*i*) Labels for light-duty trucks certified to the oxides of nitrogen standard of 1.2 grams per vehicle mile shall include the following statement:

"This vehicle conforms to U.S. EPA regulations applicable to 19— Model Year New Light-Duty Trucks."

(*ii*) Labels for light-duty trucks certified to the oxides of nitrogen standard of 1.7 grams per vehicle mile shall include the following statement:

"This vehicle conforms to U.S. EPA regulations applicable to 19— Model Year New Light-Duty Trucks with a curb weight greater than 3,450 pounds."

(*iii*) Labels for light-duty trucks certified to the oxides of nitrogen standard of 2.3 grams per vehicle miles shall include the following statement:

"This vehicle conforms to U.S. EPA regulations applicable to 19— Model Year New Light Duty Trucks with a gross vehicle weight rating greater than 6,000 pounds."

(*2*) *Heavy-duty vehicles optionally certified in accordance with the light-duty truck provisions.* "This heavy-duty vehicle conforms to the U.S. EPA regulations applicable to 19— Model Year Light-Duty Trucks under the special provision of 40 CFR 86.085-1(b).

(F) If the manufacturer is provided an alternate useful-life period under the provisions of § 86.088-21(f), the prominent statement: "This vehicle has been certified to meet U.S. EPA standards for a useful-life period of — years or —— miles of operation, whichever occurs first. This vehicle's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than years of miles (*e.g.*, hours, or miles only);

(G) A statement, if applicable, that the adjustments or modifications indicated on the label are necessary to ensure emission control compliance at the altitude specified;

(H) A statement, if applicable, that the high-altitude vehicle was designated or modified for principal use at high altitude. This statement must be affixed by the manufacturer at the time of assembly or by any dealer who performs the high-altitude modification or adjustment prior to sale to an ultimate purchaser;

(I) For vehicles that have been exempted from compliance with the high-altitude emission standards, as specified in § 86.088-9(g)(2),

(*1*) A highlighted statement (*e.g.*, underscored or boldface letters) that the vehicle is certified to applicable emission standards at low altitude only,

(*2*) A statement that the vehicle's unsatisfactory performance under high-altitude conditions makes it unsuitable for principal use at high altitude, and

(*3*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart I do not apply when the vehicle is tested at high altitude; and,

(J) For vehicles which are included in the diesel particulate averaging program, the family particulate emission limit to which the vehicle is certified.

(K) For vehicles which are included in the light-duty truck NO_x averaging program, the family NO_x emission limit to which the vehicle is certified.

(3) *Heavy-duty engines.* (i) A permanent legible label shall be affixed to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Important Engine Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family and model designations;

(D) Date of engine manufacture (month and year). The manufacturer may, in lieu of including the date of manufacture on the engine label, maintain a record of the engine manufacture dates. The manufacturer shall provide the date of manufacture records to the Administrator upon request;

(E) Engine specifications and adjustments as recommended by the manufacturer. These specifications should indicate the proper transmission position during tuneup and what accessories (*e.g.*, air conditioner), if any, should be in operation;

(F) For gasoline-fueled engines the label should include the idle speed, ignition timing, and the idle air-fuel mixture setting procedure and value (*e.g.*, idle CO, idle air-fuel ratio, idle speed drop), and valve lash;

(G) For diesel engines the label should include the advertised hp at rpm, fuel rate at advertised hp in mm^3/stroke, valve lash, initial injection timing, and idle speed;

(H) The prominent statement: "This engine conforms to U.S. EPA regulations applicable to 19— Model Year New Heavy-Duty Engines."

(I) If the manufacturer is provided with an alternate useful-life period under the provisions of § 86.088-21(f), the prominent statement: "This engine has been certified to meet U.S. EPA standards for a useful-life period of — miles or — hours of operation, whichever occurs first. This engine's actual life may very depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than miles or hours (*e.g.*, years, or hours only);

(J) *For diesel engines*. The prominent statement: "This engine has a primary intended service application as a ——-heavy-duty diesel engine." (The primary intended service applications are light, medium, and heavy, as defined in § 86.085-2);

(K) *For gasoline-fueled engines*. One of the following statements, as applicable:

(*1*) For engines certified to the emission standards under § 86.088-10(a)(1)(i), the statement: "This engine is certified for use in all heavy-duty vehicles."

(*2*) For engines certified under the provisions of § 86.088-10(a)(3)(i), the statement: "This engine is certified for use in all heavy-duty vehicles under the special provision of 40 CFR 86.088-10(a)(3)(i)."

(*3*) For engines certified to the emission standards under § 86.088-10(a)(1)(ii), the statement: "This engine is certified for use only in heavy-duty vehicles with a gross vehicle weight rating above 14,000 lbs."

(iv) The label may be made up of one or more pieces: *Provided*, that all pieces are permanently attached to the same engine or vehicle part as applicable.

(4)(i) *Gasoline-fueled heavy-duty vehicles*. A permanent, legible label shall be affixed in a readily visible position in the engine compartment. If such vehicles do not have an engine compartment, the label required in paragraphs (a)(4) and (g)(1) of this section shall be affixed in a readily visible position on the operator's enclosure or on the engine.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numericals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Evaporative family identification;

(D) The maximum nominal fuel tank capacity (in gallons) for which the evaporative control system is certified; and,

(E) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to gasoline-fueled heavy-duty vehicles.

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle (or engine) conforms to any applicable state emission standards for new motor vehicles (or new motor vehicle engines) or any other information that such manufacturer deems necesary for, or useful to, the proper operation and satisfactory maintenance of the vehicle (or engine).

(c)(1) The manufacturer of any light-duty vehicle or light-duty truck subject to the emission standards (or family particulate emission limits, or family NO_x emission limits, as appropriate) of this subpart shall, in addition and subsequent to setting forth those statements on the label required by the Department of Transportation (DOT) pursuant to 49 CFR 567.4, set forth on the DOT label or on an additional label located in proximity to the DOT label and affixed as described in 40 CFR 567.4(b), the following information in the English language, lettered in block letters and numerals not less than three thirty-seconds of an inch high, of a color that contrasts with the background of the label:

(i) The Heading: "Vehicle Emission Control Information."

(ii)(A) *For light-duty vehicles*, the statement: "This Vehicle Conforms to U.S. EPA Regulations Applicable to 19— Model Year New Motor Vehicles."

(B) *For light-duty trucks*. (*1*) The statement: "This vehicle conforms to U.S. EPA regulations applicable to 19— Model Year New Light-Duty Trucks."

(*2*) If the manufacturer is provided an alternate useful-life period under the provisions of § 86.088-21(f), the prominent statement: "This vehicle has been certified to meet U.S. EPA standards for a useful-life period of — years or —— miles of operation, whichever occurs first. This vehicle's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than years or miles (*e.g.*, hours, or miles only).

(iii) One of the following statements, as applicable, in letters and numerals not less than six thirty-seconds of an inch high and of a color that contrasts with the background of the label:

(A) For all vehicles certified as non-catalyst-equipped: "NON-CATALYST"

(B) For all vehicles certified as catalyst-equipped which are included in a manufacturer's catalyst control program for which approval has been given by the Administrator: "CATALYST—APPROVED FOR IMPORT"

(C) For all vehicles certified as catalyst-equipped which are not included in a manufacturer's catalyst control program for which prior approval has been given by the Administrator: "CATALYST"

(2) In lieu of selecting either of the labeling options of paragraph (c)(1) of this section, the manufacturer may add the information required by paragraph (c)(1)(iii) of this section to the label required by paragraph (a) of this section. The required information will be set forth in the manner prescribed by paragraph (c)(1)(iii) of this section.

(d) Incomplete light-duty trucks and incomplete heavy-duty vehicles optionally certified in accordance with the light-duty truck provisions shall have one of the following prominent statements, as applicable, printed on the label required by paragraph (a)(2) of this section in lieu of the statement required by paragraph (a)(2)(iii)(E) of this section.

(1) *Light-duty trucks*. (i) Labels for light-duty trucks certified to the oxides of nitrogen standard of 1.2 grams per vehicle mile shall include the following statement:

"This vehicle conforms to U.S. EPA regulations applicable to 19— Model Year New Light-Duty Trucks when it does not exceed ______ pounds in curb weight, ______ pounds in gross vehicle weight rating, and

______ square feet in frontal area."

(ii) Labels for light-duty trucks certified to the oxides of nitrogen standards of 1.7 grams per vehicle mile shall include the following statement:

"This vehicle conforms to U.S. EPA regulations applicable to 19— Model Year New Light-Duty Trucks when it is between 3,450 pounds and ______ pounds in curb weight and it does not exceed ______ pounds in gross vehicle weight rating nor ______ square feet in frontal area."

(iii) Labels for light-duty trucks certified to the oxides of nitrogen standard of 2.3 grams per vehicle mile shall include the following statement:

"This vehicle conforms to U.S. EPA regulations applicable to 19— Model Year New Light-Duty Trucks when it is between 3,450 pounds and ______ pounds in curb weight, between 6,000 pounds and ______ pounds in gross vehicle weight rating and it does not exceed ______ square feet in frontal area."

(2) *Heavy-duty vehicles optionally certified in accordance with the light-duty truck provisions.* "This heavy-duty vehicle conforms to the U.S. EPA regulations applicable to 19— Model Year Light-Duty Trucks under the special provision of 40 CFR 86.085-1(b) when it does not exceed ______ pounds in curb weight, ______ pounds in gross vehicle weight rating, and ______ square feet in frontal area."

(e) Incomplete heavy-duty vehicles having a gross vehicle weight rating of 8,500 pounds or less shall have one of the following statements printed on the label required by paragraph (a)(3) of this section in lieu of the statement required by paragraph (a)(3)(iii)(H) of this section: "This engine conforms to U.S. EPA regulations applicable to 19— Model Year New Heavy-Duty Engines when installed in a vehicle completed at a curb weight of more than 6,000 pounds or with a frontal area of greater than 45 square feet."

(f) The manufacturer of any incomplete light-duty vehicle or light-duty truck shall notify the purchaser of such vehicle of any curb weight, frontal area, or gross vehicle weight rating limitations affecting the emission certificate applicable to that vehicle. This notification shall be transmitted in a manner consistent with National Highway Traffic Safety Administration safety notification requirements published in 49 CFR Part 568.

(g)(1) Incomplete gasoline-fueled heavy-duty vehicles shall have the following prominent statement printed on the label required in paragraph (a)(4) of this section: "(Manufacturer's corporate name) has determined that this vehicle conforms to U.S. EPA regulations applicable to 19— Model Year New Gasoline-Fueled Heavy-Duty Vehicles when completed with a nominal fuel tank capacity not to exceed —— gallons. Persons wishing to add fuel tank capacity beyond the above maximum must submit a written statement to the Administrator that the hydrocarbon storage system has been upgraded according to the requirements of 40 CFR 86.085-35(g)(2)."

(2) Persons wishing to add fuel tank capacity beyond the maximum specified on the label required in paragraph (g)(1) of this section shall:

(i) Increase the amount of fuel tank vapor storage material according to the following function:

$$\mathrm{Cap_f} = \mathrm{Cap_i} \left(\frac{\mathrm{T.\ Vol.}}{\mathrm{Max.\ Vol.}} \right)$$

Where:

$\mathrm{Cap_f}$ = final amount of fuel tank vapor storage material, grams.

$\mathrm{Cap_i}$ = initial amount of fuel tank vapor storage material, grams.

T. Vol. = total fuel tank volume of completed vehicle, gallons.

Max. Vol. = maximum fuel tank volume as specified on the label required in paragraph (g)(1) of this section, gallons.

(ii) Use, if applicable, hosing for fuel vapor routing which is at least as impermeable to hydrocarbon vapors as that used by the primary manufacturer.

(iii) Use vapor storage material with the same adsorptive characteristics as that used by the primary manufacturer.

(iv) Connect, if applicable, any new hydrocarbon storage device to the existing hydrocarbon storage device in series such that the original hydrocarbon storage device is situated between the fuel tank and the new hydrocarbon storage device. The original hydrocarbon storage device shall be sealed such that vapors cannot reach the atmosphere. The elevation of the original hydrocarbon storage device shall be equal to or lower than the new hydrocarbon storage device.

(v) Submit a written statement to the Administrator that paragraphs (g)(2)(i) through (g)(2)(iv) of this section have been complied with.

(3) If applicable, the Administrator will send a return letter verifying the receipt of the written statement required in paragraph (g)(2)(v) of this section.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10688, Mar. 15, 1985, as amended at 52 FR 47864, Dec. 16, 1987]

§ 86.090-1 General applicability.

(a) The provisions of this subpart apply to: 1990 and later model year new Otto-cycle and diesel light-duty vehicles; 1990 and later model year new Otto-cycle and diesel light-duty trucks; and, 1990 and later model year new Otto-cycle and diesel heavy-duty engines.

(b) *Optional applicability.* A manufacturer may request to certify any heavy-duty vehicle of 10,000 pounds Gross Vehicle Weight Rating or less to the light-duty truck provisions. Heavy-duty engine or vehicle provisions do not apply to such a vehicle.

(c) [Reserved]

(d) *Alternative Durability Program.* For 1990 and later model year light-duty vehicles and light-duty trucks, a manufacturer may elect to participate in the Alternative Durability Program. This optional program provides an alternative method of determining exhaust emission control system durability. The general procedures and a description of the programs are contained in § 86.085-13 and specific provisions on test vehicles and compliance procedures are contained in § 86.085-24 and § 86.088-28 respectively.

(e) *Small-Volume Manufacturers.* Special certification procedures are available for any manufacturer whose projected combined U.S. sales of light-duty vehicles, light-duty trucks, and heavy-duty engines in its product line are fewer than 10,000 units for the model year in which the manufacturer seeks certification. In order to certify its product line under these optional procedures, the small-volume manufacturer must first obtain the Administrator's approval. Vehicles produced at facilities leased, operated, controlled, supervised, or is ten percent or greater part owned by the manufacturer shall be counted in calculating the total sales of the manufacturer. The small-volume manufacturer's certification procedures are described in § 86.090-14.

(f) *Optional Procedures for Determining Exhaust Opacity.* (1) The provisions of Subpart I apply to tests which are performed by the Administrator, and optionally, by the manufacturer.

(2) Measurement procedures, other than that described in Subpart I, may be used by the manufacturer provided the manufacturer satisfies the requirements of § 86.090-23(f).

(3) When a manufacturer chooses to use an alternative measurement procedure it has the responsibility to determine whether the results obtained by the procedure will correlate with the results which would be obtained from the measurement procedure in Subpart I. Consequently, the Administrator will not routinely approve or disapprove any alternative opacity measurement procedure or any associated correlation data which the manufacturer elects to use to satisfy the data requirements of Subpart I.

(4) If a confirmatory test(s) is performed and the results indicate there is a systematic problem suggesting that the data generated under an optional alternative measurement procedure do not adequately correlate with Subpart I data, EPA may require that all certificates of conformity not already issued be based on data from Subpart I procedures.

[54 FR 14459, Apr. 11, 1989]

§ 86.090–2 Definitions.

The definitions in § 86.088–2 remain effective. The definitions in this section apply beginning with the 1990 model year.

"Composite particulate standard," for a manufacturer which elects to average light-duty vehicles and light-duty trucks together in either the petroleum-fueled or methanol-fueled light-duty particulate averaging program, means that standard calculated using the following equation and rounded to the nearest one-hundredth (0.01) of a gram per mile:

$$\frac{(PROD_{LDV})(STD_{LDV}) + (PROD_{LDT})(STD_{LDT})}{(PROD_{LDV}) + (PROD_{LDT})} = \text{Manufacturer composite particulate standard}$$

Where:

$PROD_{LDV}$ represents the manufacturer's total petroleum-fueled diesel or methanol-fueled diesel light-duty vehicle production for those engine families being included in the appropriate average for a given model year.

STD_{LDV} represents the light-duty vehicle particulate standard.

$PROD_{LDT}$ represents the manufacturer's total petroleum-fueled diesel or methanol-fueled diesel light-duty truck production for those engine families being included in the appropriate average for a given model year.

STD_{LDT} represents the light-duty truck particulate standard.

"Diesel" means type of engine with operating characteristics significantly similar to the theoretical Diesel combustion cycle. The non-use of a throttle during normal operation is indicative of a diesel engine.

"Flexible fuel vehicle (or engine)" means any motor vehicle (or motor vehicle engine) engineered and designed to be operated on a petroleum fuel, a methanol fuel, or any mixtures of the two.

"Methanol-fueled" means any motor vehicle or motor vehicle engine that is engineered and designed to be operated using methanol fuel (*i.e.,* a fuel that contains at least 50 percent methanol (CH_3OH) by volume) as fuel. Flexible fuel vehicles are methanol-fueled vehicles.

"Non-oxygenated hydrocarbon" means organic emissions measured by a flame ionization detector excluding methanol.

"Organic Material Hydrocarbon Equivalent" means the sum of the carbon mass contributions of non-oxygenated hydrocarbons, methanol and formaldehyde as contained in a gas sample, expressed as gasoline fueled vehicle hydrocarbons. In the case of exhaust emissions, the hydrogen-to-carbon ratio of the equivalent hydrocarbon is 1.85:1. In the case of diurnal and hot soak emissions, the hydrogen-to-carbon ratios of the equivalent hydrocarbons are 2.33:1 and 2. 2:1, respectively.

"Otto-cycle" means type of engine with operating characteristics significantly similar to the theoretical Otto combustion cycle. The use of a throttle during normal operation is indicative of an Otto-cycle engine.

"Primary intended service class" means:

(a) The primary service application group for which a heavy-duty diesel engine is designed and marketed, as determined by the manufacturer. The primary intended service classes are designated as light, medium, and heavy heavy-duty diesel engines. The determination is based on factors such as vehicle GVW, vehicle usage and operating patterns, other vehicle design characteristics, engine horsepower, and other engine design and operating characteristics.

(1) Light heavy-duty diesel engines usually are non-sleeved and not designed for rebuild; their rated horsepower generally ranges from 70 to 170. Vehicle body types in this group might include any heavy-duty vehicle built for a light-duty truck chassis, van trucks, multi-stop vans, recreational vehicles, and some single axle straight trucks. Typical applications would include personal transportation, light-load commercial hauling and delivery, passenger service, agriculture, and

construction. The GVWR of these vehicles is normally less than 19,500 lbs.

(2) Medium heavy-duty diesel engines may be sleeved or non-sleeved and may be designed for rebuild. Rated horsepower generally ranges from 170 to 250. Vehicle body types in this group would typically include school buses, tandem axle straight trucks, city tractors, and a variety of special purpose vehicles such as small dump trucks, and trash compactor trucks. Typical applications would include commercial short haul and intracity delivery and pickup. Engines in this group are normally used in vehicles whose GVWR varies from 19,500-33,0000 lbs.

(3) Heavy heavy-duty diesel engines are sleeved and designed for multiple rebuilds. Their rated horsepower generally exceeds 250. Vehicles in this group are normally tractors, trucks, and buses used in inter-city, long-haul applications. These vehicles normally exceed 33,000 lbs GVWR.

"Throttle" means a device used to control an engines power output by limiting the amount of air entering the combustion chamber.

"Useful life" means:

(a) For light-duty vehicles a period of use of 5 years or 50,000 miles, whichever first occurs.

(b) For a light-duty truck engine family, a period of use of 11 years or 120,000 miles, whichever occurs first.

(c) For an Otto-cycle heavy-duty engine family, a period of use of 8 years of 110,000 miles, whichever first occurs.

(d) For a diesel heavy-duty engine family:

(1) For light heavy-duty diesel engines, period of use of 8 years or 110,000 miles, whichever first occurs.

(2) For medium heavy-duty diesel engines, a period of use of 8 years or 185,000 miles, whichever first occurs.

(3) For heavy heavy-duty diesel engines, a period of use of 8 years or 290,000 miles, whichever first occurs.

(e) As an option for both light-duty truck and heavy-duty engine families, an alternative useful life period assigned by the Administrator under the provisions of paragraph (f) of § 86.090-21.

(f) The useful-life period for purposes of the emissions defect warranty and emissions performance warranty shall be a period of 5 years/50,000 miles whichever first occurs, for light-duty trucks Otto-cycle heavy-duty engines and light heavy-duty diesel engines. For all other heavy-duty diesel engines the aforementioned period is 5 years/100,000 miles, whichever first occurs. However, in no case may this period be less than the manufacturer's basic mechanical warranty period for the engine family.

[54 FR 14459, Apr. 11, 1989]

§ 86.090-3 Abbreviations.

(a) The abbreviations in § 86.078-3 remain effective. The abbreviations in this section apply beginning with the 1990 model year.

(b) The abbreviations in this section apply to this subpart, and also to Subparts B, E, F, M, N, and P of this part, and have the following meanings:

DNPH—2,4-dinitrophenylhydrazine.

GC—Gas chromatograph.

HPLC—High-pressure liquid chromatography.

MeOH—Methanol (CH_3OH).

OMHCE—Organic Material Hydroarbon Equivalent.

UV—Ultraviolet.

[54 FR 14460, Apr. 11, 1989]

§ 86.090-5 General standards; increase in emissions; unsafe conditions.

(a)(1) Every new motor vehicle (or new motor vehicle engine) manufactured for sale, sold, offered for sale, introduced, or delivered for introduction to commerce, or imported into the United States for sale or resale which is subject to any of the standards prescribed in this subpart shall be covered by a certificate of conformity issued pursuant to §§ 86.090-21, 86.090-22, 86.090-23, 86.090-29, 86.090-30, 86.079-31, 86.079-32, 86.079-33, and 86.082-34.

(2) No heavy-duty vehicle manufacturer shall take any of the actions specified in section 203(a)(1) of the Act with respect to any Otto-cycle or diesel heavy-duty vehicle which uses an engine which has not been certified as meeting applicable standards.

(b)(1) Any system installed on or incorporated in a new motor vehicle (or new motor vehicle engine) to enable such vehicle (or engine) to conform to standards imposed by this subpart.

(i) Shall not in its operation or function cause the emission into the ambient air of any noxious or toxic substance that would not be emitted in the operation of such vehicle (or engine) without such system, except as specifically permitted by regulation; and

(ii) Shall not in its operation, function or malfunction result in any unsafe condition endangering the motor vehicle, its occupants, or persons or property in close proximity to the vehicle.

(2) In establishing the physically adjustable range of each adjustable parameter on a new motor vehicle (or new motor vehicle engine), the manufacturer shall ensure that, taking into consideration the production tolerances, safe vehicle driveability characteristics are available within that range, as required by section 202(a)(4) of the Clean Air Act.

(3) Every manufacturer of new motor vehicles (or new motor vehicle engines) subject to any of the standards imposed by this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicles (or motor vehicle engines) in accordance with good engineering practice to ascertain that such test vehicles (or test engines) will meet the requirements of this section for the useful life of the vehicle (or engine).

[54 FR 14460, Apr. 11, 1989]

§ 86.090-8 Emission standards for 1990 and later model year light-duty vehicles.

(a)(1) Exhaust emissions from 1990 and later model year light-duty vehicles shall not exceed (compliance with these standards is optional for 1990 model year methanol-fueled vehicles):

(i)(A) *Hydrocarbons (for petroleum-fueled Otto-cycle and diesel vehicles).* 0.41 gram per vehicle mile (0.26 gram per vehicle kilometer).

(B) *Organic Material Hydrocarbon Equivalent (for methanol-fueled Otto-cycle and diesel vehicles).* 0.41 gram per vehicle mile (0.26 gram per vehicle kilometer).

(ii) *Carbon monoxide.* 3.4 grams per vehicle mile (2.1 grams per vehicle kilometer).

(iii) *Oxides of nitrogen.* 1.0 gram per vehicle mile (0.63 gram per vehicle kilometer).

(iv) *Particulate (for diesel vehicles only).*

(A) 0.20 gram per vehicle mile (0.12 gram per vehicle kilometer).

(B) A manufacturer may elect to include all or some of its diesel light-duty vehicle engine families in the appropriate particulate averaging program (petroleum or methanol), provided that vehicles produced for sale in California or in designated high-altitude areas may be averaged only within each of these areas. Averaging is not permitted between fuel types. If the manufacturer elects to average light-duty vehicles and light-duty trucks together in the appropriate particulate averaging program, its composite particulate standard applies to the combined set of light-duty vehicles and light-duty trucks included in the average and is calculated as defined in § 86.090-2.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures.

(b) Fuel evaporative emissions from 1990 and later model year light-duty vehicles shall not exceed (compliance with these standards is optional for 1990 model year methanol-fueled engines):

(1) *Hydrocarbons (for gasoline-fueled vehicles).* 2.0 grams per test.

(2) *Organic Material Hydrocarbon Equivalent (for methanol-fueled vehicles).* 2.0 grams carbon per test.

(3) The standards set forth in paragraphs (b) (1) and (2) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1990 and later model year Otto-cycle or methanol-fueled diesel light-duty vehicle.

(d) through (f) [Reserved]

(g) Any 1990 and later model year light-duty vehicle that a manufacturer wishes to certify for sale shall meet the emission standards under both low- and high-altitude conditions as specified in § 86.082–2, except as provided in paragraphs (h) and (i) of this section. Vehicles shall meet emission standards under both low- and high-altitude conditions without manual adjustments or modifications. Any emission control device used to meet emission standards under high-altitude conditions shall initially actuate (automatically) no higher than 4,000 feet above sea level.

(h) The manufacturer may exempt 1990 and later model year vehicles from compliance at high altitude with the emission standards set forth in paragraphs (a) and (b) of this section if the vehicles are not intended for sale at high altitude and if the requirements of paragraphs (h) (1) and (2) of this section are met.

(1) A vehicle configuration shall only be considered eligible for exemption under paragraph (h) of this section if the requirements of either paragraph (h) (l) (i), (ii), (iii), or (iv) of this section are met.

(i) Its design parameters (displacement-to-weight ratio (D/W) and engine speed-to-vehicle-speed ratio (N/V)) fall within the exempted range for that manufacturer for that year. The exempted range is determined according to the following procedure:

(A) The manufacturer shall graphically display the D/W and N/V data of all vehicle configurations it will offer for the model year in question. The axis of the abscissa shall be D/W (where (D) is the engine displacement expressed in cubic centimeters and (W) is the equivalent vehicle test weight expressed in pounds), and the axis of the ordinate shall be N/V (where (N) is the crankshaft speed expressed in revolutions per minute and (V) is the vehicle speed expressed in miles per hour). At the manufacturer's option, either the 1:1 transmission gear ratio or the lowest numerical gear ratio available in the transmission will be used to determine N/V. The gear selection must be the same for all N/V data points on the manufacturer's graph. For each transmission/axle ratio combination, only the lowest N/V value shall be used in the graphical display.

(B) The product line is then defined by the equation, $N/V=C(D/W)^{-0.9}$, where the constant, C, is determined by the requirement that all the vehicle data points either fall on the line or lie to the upper right of the line as displayed on the graphs.

(C) The exemption line is then defined by the equation, $N/V=C(0.84\ D/W)^{-0.9}$, where the constant, C is the same as that found in paragraph (h)(1)(i)(B) of this section.

(D) The exempted range includes all values of N/V and D/W which simultaneously fall to the lower left of the exemption line as drawn on the graph.

(ii) Its design parameters fall within the alternate exempted range for that manufacturer that year. The alternate exempted range is determined by substituting rated horsepower (hp) for displacement (D) in the exemption procedure described in paragraph (h)(1)(i) of this section and by using the product line $N/V = C(hp/W)^{-0.9}$.

(A) Rated horsepower shall be determined by using the Society of Automotive Engineers Test Procedure J 1349, or any subsequent version of that test procedure. Any of the horsepower determinants within that test procedure may be used, as long as it is used consistently throughout the manufacturer's product line in any model year.

(B) No exemptions will be allowed under paragraph (h)(1)(ii) of this section to any manufacturer that has exempted vehicle configurations as set forth in paragraph (h)(1)(i) of this section.

(iii) Its acceleration time (the time it takes a vehicle to accelerate from 0 miles per hour to a speed not less than 40 miles per hour and not greater than 50 miles per hour) under high-altitude conditions is greater than the largest acceleration time under low-altitude conditions for that manufacturer for that year. The procedure to be followed in making this determination is:

(A) The manufacturer shall list the vehicle configuration and acceleration time under low-altitude conditions of that vehicle configuration which has the highest acceleration time under low-altitude conditions of all the vehicle configurations it will offer for the model year in question. The manufacturer shall also submit a description of the methodology used to make this determination.

(B) The manufacturer shall then list the vehicle configurations and acceleration times under high-altitude conditions of all those vehicle configurations which have higher acceleration times under high-altitude conditions than the highest acceleration time at low altitude identified in paragraph (h)(1)(iii)(A) of this section.

(iv) In lieu of performing the test procedure of paragraphs (h)(1)(iii) (A) and (B) of this section, its acceleration time can be estimated based on the manufacturer's engineering evaluation, in accordance with good engineering practice, to meet the exemption criteria of paragraph (h)(1)(iii) of this section.

(2) A vehicle shall only be considered eligible for exemption under this paragraph if at least one configuration of its model type (and transmission configuration in the case of vehicles equipped with manual transmissions, excluding differences due to the presence of overdrive) is certified to meet emission standards under high-altitude conditions as specified in paragraph (a) through (g) of this section. The Certificate of Conformity (the Certificate) covering any exempted configuration(s) will also apply to the corresponding non-exempt configuration(s) required under this subparagraph. As a condition to the exemption, any suspension, revocation, voiding, or withdrawal of the Certificate as it applies to a non-exempt configuration for any reason will result in a suspension of the Certificate as it applies to the corresponding exempted configuration(s) of that model type, unless there is at least one other corresponding non-exempt configuration of the same model type still covered by the Certificate. The suspension of the Certificate as it applies to the exempted configuration(s) will be terminated when any one of the following occurs:

(i) Another corresponding non-exempt configuration(s) receive(s) coverage under the Certificate; or

(ii) Suspension of the Certificate as it applies to the corresponding non-exempt configuration(s) is terminated; or

(iii) The Agency's action(s), with respect to suspension, revocation, voiding or withdrawal of the Certificate as it applies to the corresponding non-exempt configuration(s), is reversed.

(3) The sale of a vehicle for principal use at a designated high-altitude location that has been exempted as set forth in paragraph (h) of this section will be considered a violation of Section 203(a)(1) of the Clean Air Act.

(i)(1) The manufacturers may exempt 1990 and later model year vehicles from compliance at low altitude with the emission standards set forth in paragraphs (a) and (b) of this section if the vehicles:

(i) Are not intended for sale at low altitude; and

(ii) Are equipped with a unique, high-altitude axle ratio (rear-wheel drive vehicles) or a unique, high-altitude drivetrain (front-wheel drive vehicles) with a higher N/V ratio than other configurations of that model type which are certified in compliance with the emission standards of paragraphs (a) and (b) of this section under low-altitude conditions.

(2) The sale of a vehicle for principal use at low altitude that has been exempted as set forth in paragraph (h)(1) of this section will be considered a violation of section 203(a)(1) of the Clean Air Act.

[54 FR 14461, Apr. 11, 1989]

§ 86.090–9 Emission standards for 1990 and later model year light-duty trucks.

(a)(1) The standards set forth in paragraphs (a) through (c) of this section shall apply to light-duty trucks sold for principal use at other than a designated high-altitude location. Exhaust emissions from 1990 and later model year light-duty trucks shall not exceed (compliance with these standards is optional for 1990 model year methanol-fueled vehicles):

(i)(A) *Hydrocarbons (for petroleum-fueled Otto-cycle and diesel light-duty* *trucks*). 0.80 gram per vehicle mile (0.50 gram per vehicle kilometer).

(B) *Organic Material Hydrocarbon Equivalent* (*for methanol-fueled Otto-cycle and diesel light-duty trucks*). 0.80 gram per vehicle mile (0.50 gram per vehicle kilometer).

(ii) *Carbon monoxide.* (A) 10 grams per vehicle mile (6.2 grams per vehicle kilometer).

(B) 0.50 percent of exhaust gas flow at curb idle (for Otto-cycle and methanol-fueled diesel light-duty trucks only).

(iii) *Oxides of nitrogen.* (A) For light-duty trucks up to and including 3,750 lbs loaded vehicle weight, 1.2 grams per vehicle mile (0.75 gram per vehicle kilometer).

(B) For light-duty trucks greater loaded vehicle weight, 1.7 grams per vehicle mile (1.1 grams per vehicle kilometer).

(C) A manufacturer may elect to include all or some of its light-duty truck engine families in the NO_x averaging program, provided that trucks produced for sale in California or in designated high-altitude areas may be averaged only within each of those areas. Petroleum-fueled and methanol-fueled engine families may not be averaged together. Otto-cycle and diesel engines families also may not be averaged together. If the manufacturer elects to participate in the NO_x averaging program, individual family NO_x emission limits may not exceed 2.3 grams per mile. If the manufacturer elects to average together NO_x emissions of light-duty trucks subject to the standards of paragraphs (a)(1)(iii)(A) and (a)(1)(iii)(B) of this section, its composite NO_x standard applies to the combined fleets of light-duty trucks up to and including, and over, 3,750 lbs loaded vehicle weight included in the average and is calculated as defined in § 86.088–2.

(iv) *Particulate* (*for diesel light-duty trucks only*). (A) For light-duty trucks up to and including 3,750 lbs. loaded vehicle weight, 0.26 gram per vehicle mile (0.16 gram per vehicle kilometer).

(B) For light-duty trucks 3,751 lbs and greater loaded vehicle weight, 0.45 gram per vehicle mile (0.28 gram per vehicle kilometer).

(C) A manufacturer may elect to include all or some of its diesel light-duty truck engine families subject to the standard of paragraph (a)(1)(w)(A) of this section in the appropriate particulate averaging program (petroleum or methanol), provided that trucks produced for sale in California or in designated high-altitude areas may be averaged only within each of those areas. Averaging is not permitted between fuel types. If the manufacturer elects to average both light-duty trucks subject to the standard of paragraph (a)(1)(w)(A) of this section and light-duty vehicles together in the appropriate particulate averaging program, its composite particulate standard applies to the combined set of light-duty vehicles and light-duty trucks included in the average and is calculated as defined in § 86.088–2.

(2) The standards set forth in paragraphs (a)(1)(i), (a)(1)(ii)(A), (a)(1)(iii), and (a)(1)(iv) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures. The standard set forth in paragraph (a)(1)(ii)(B) of this section refers to the exhaust emitted at curb idle and measured and calculated in accordance with the procedures set forth in Subpart P of this part.

(b) Fuel evaporative emissions from 1990 and later model year light-duty trucks shall not exceed (compliance with these standards is optional for 1990 model year methanol-fueled vehicles):

(1) *Hydrocarbons* (*for gasoline-fueled light-duty trucks*). 2.0 grams per test.

(2) *Organic Material Hydrocarbon Equivalent* (*for methanol-fueled light-duty trucks*). 2.0 grams per test.

(3) The standards set forth in paragraphs (b) (1) and (2) of this section refer to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1990 and later model year light-duty truck.

(d)(1) Model year 1990 and later light-duty trucks sold for principal use at a designated high-altitude location shall be capable of meeting the following exhaust emission standards when tested under high-altitude conditions:

(i)(A) *Hydrocarbons (for petroleum-fueled Otto-cycle and diesel light-duty trucks).* 1.0 grams per vehicle mile (0.62 grams per vehicle kilometer).

(B) *Organic Material Hydrocarbon Equivalent (for methanol-fueled Otto-cycle and diesel light-duty trucks).* 1.0 gram per vehicle mile (0.62 gram per vehicle kilometer).

(ii) *Carbon Monoxide.* (A) 14 grams per vehicle mile (8.7 grams per vehicle kilometer).

(B) 0.50 percent of exhaust gas flow at curb idle (for Otto-cycle and methanol-fueled diesel light-duty trucks only).

(iii) *Oxides of Nitrogen.* (A) For light-duty trucks up to and including 3,750 lbs loaded vehicle weight, 1.2 grams per vehicle mile (0.75 grams per vehicle kilometer).

(B) For light-duty trucks 3,751 lbs and greater loaded vehicle weight, 1.7 grams per vehicle mile (1.1 grams per vehicle kilometer).

(iv) *Particulate (for diesel light-duty trucks only).* For light-duty trucks up to and including 3,750 lbs loaded vehicle weight, 0.26 gram per vehicle mile (0.16 gram per vehicle kilometer).

(2) The standards set forth in paragraph (d)(1)(i), (d)(1)(ii)(A), (d)(1)(iii), and (d)(1)(iv) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures. The standard set forth in paragraph (d)(1)(ii)(B) of this section refers to the exhaust emitted at curb idle and measured and calculated in accordance with the procedures set forth in Subpart P of this part.

(e) Fuel evaporative emissions from 1990 and later model year light-duty trucks sold for principal use at a designated high-altitude location, when tested under high-altitude conditions, shall not exceed:

(1) *Hydrocarbons (for gasoline-fueled light-duty trucks).* 2.6 grams per test.

(2) *Organic Material Hydrocarbon Equivalent (for methanol-fueled light-duty trucks).* 2.6 grams per test.

(3) The standards set forth in paragraphs (e) (1) and (2) of this section refer to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(f) No crankcase emissions shall be discharged into the ambient atmosphere from any 1990 and later model year light-duty trucks sold for principal use at a designated high-altitude location.

(g)(1) Any light-duty truck that a manufacturer wishes to certify for sale at low altitude must be capable of meeting high-altitude emission standards (specified in paragraphs (d) through (f) of this section). The manufacturer may specify vehicle adjustments or modifications to allow the vehicle to meet high-altitude standards but these adjustments or modifications may not alter the vehicle's basic engine, inertia weight class, transmission configuration, and axle ratio.

(i) A manufacturer may certify unique configurations to meet the high-altitude standards but is not required to certify these vehicle configurations to meet the low-altitude standards.

(ii) Any adjustments or modifications that are recommended to be performed on vehicles to satisfy the requirements of paragraph (g)(1) of this section:

(A) Shall be capable of being effectively performed by commercial repair facilities, and

(B) Must be included in the manufacturer's application for certification.

(2) The manufacturer may exempt 1990 and later model year vehicles from compliance with the high-altitude emission standards set forth in paragraphs (d) and (e) of this section if the vehicles are not intended for sale at high altitude and if the following requirements are met. A vehicle configuration shall only be considered eligible for exemption if the requirements of either paragraph (g)(2) (i), (ii), (iii), or (iv) of this section are met.

(i) Its design parameters (displacement-to-weight ratio (D/W) and engine speed to-vehicle-speed ratio (N/V)) fall within the exempted range for that manufacturer for that year. The exempted range is determined according to the following procedure:

(A) The manufacturer shall graphically display the D/W and N/V data of all vehicle configurations it will offer for the model year in question. The axis of the abscissa shall be D/W (where (D) is the engine displacement expressed in cubic centimeters and (W) is the gross vehicle weight (GVW) expressed in pounds), and the axis of the ordinate shall be N/V (where (N) is the crankshaft speed expressed in revolutions per minute and (V) is the vehicle speed expressed in miles per hour). At the manufacturer's option, either the 1:1 transmission gear ratio or the lowest numerical gear ratio available in the transmission will be used to determine N-V. The gear selection must be the same for all N/V data points on the manufacturer's graph. For each transmission/axle ratio combination, only the lowest N/V value shall be used in the graphical display.

(B) The product line is then defined by the equation, $N/V=C(D/W)^{-0.9}$, where the constant, C, is determined by the requirement that all the vehicle data points either fall on the line or lie to the upper right of the line as displayed on the graphs.

(C) The exemption line is then defined by the equation, $N/V=C(0.84\ D/W)^{-0.9}$, where the constant, C is the same as that found in paragraph (g)(2)(i)(B) of this section.

(D) The exempted range includes all values of N/V and D/W which simultaneously fall to the lower left of the exemption line as drawn on the graph.

(ii) Its design parameters fall within the alternate exempted range for that manufacturer that year. The alternate exempted range is determined by substituting rated horsepower (hp) for displacement (D) in the exemption procedure described in paragraph (g)(2)(i) of this section ahd by using the product line $N/V=C(hp/W)^{-0.9}$.

(A) Rated horsepower shall be determined by using the Society of Automotive Engineers Test Procedure J 1349, or any subsequent version of that test procedure. Any of the horsepower determinants within that test procedure may be used, as long as it is used consistently throughout the manufacturer s product line in any model year.

(B) No exemptions will be allowed under paragraph (g)(2)(ii) of this section to any manufacturer that has exempted vehicle configurations as set forth in paragraph (g)(2)(i) of this section.

(iii) Its acceleration time (the time it takes a vehicle to accelerate from 0 to a speed not less than 40 miles per hour and not greater than 50 miles per hour) under high-altitude conditions is greater than the largest acceleration time under low-altitude conditions for that manufacturer for that year. The procedure to be followed in making this determination is:

(A) The manufacturer shall list the vehicle configuration and acceleration time under low-altitude conditions of that vehicle configuration which has the highest acceleration time under low-altitude conditions of all the vehicle configurations it will offer for the model year in question. The manufacturer shall also submit a description of the methodology used to make this determination.

(B) The manufacturer shall then list the vehicle configurations and acceleration times under high-altitude conditions of all those vehicle configurations which have higher acceleration times under high-altitude conditions than the highest acceleration time at low altitude identified in paragraph (g)(2)(iii)(A) of this section.

(iv) In lieu of performing the test procedure of paragraph (g)(2)(iii) of this section, its acceleration time can be estimated based on the manufacturer's engineering evaluation, in accordance with good engineering practice, to meet the exemption criteria of paragraph (g)(2)(iii) of this section.

(3) The sale of a vehicle for principal use at a designated high-altitude location that has been exempted as set forth in paragraph (g)(2) of this section will be considered a violation of section 203(a)(1) of the Clean Air Act.

[52 FR 47865, Dec. 16, 1987, as amended at 54 FR 14462, Apr. 11, 1989]

§ 86.090–10 Emission standards for 1990 and later model year Otto-cycle heavy-duty engines and vehicles.

(a)(1) Exhaust emissions from new 1990 and later model year Otto-cycle engines shall not exceed (compliance with these standards is optional for 1990 model year methanol-fueled engines):

(i) For *gasoline-fueled Otto-cycle engines* intended for use in all vehicles except as provided in paragraph (a)(3) of this paragraph,

(A) *Hydrocarbons.* 1.1 grams per brake horsepower-hour (0.41 gram per megajoule), as measured under transient operating conditions.

(B) *Carbon monoxide.* (*1*) 14.4 grams per brake horsepower-hour (5.36 grams per megajoule), as measured under transient operating conditions.

(*2*) *For gasoline-fueled Otto-cycle heavy-duty engines utilizing aftertreatment technology.* 0.50 percent of exhaust gas flow at curb idle.

(C) *Oxides of nitrogen.* 6.0 grams per brake horsepower-hour (2.2 grams per megajoule), as measured under transient operating conditions.

(ii) For *gasoline-fueled Otto-cycle engines* intended for use only in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 lbs,

(A) *Hydrocarbons.* 1.9 grams per brake horsepower-hour (0.71 gram per megajoule), as measured under transient operating conditions.

(B) *Carbon Monoxide.* (*1*) 37.1 grams per brake horsepower-hour (13.8 grams per megajoule), as measured under transient operating conditions.

(*2*) *For gasoline-fueled Otto-cycle heavy-duty engines utilizing aftertreatment technology.* 0.50 percent of exhaust gas flow at curb idle.

(C) *Oxides of nitrogen.* 6.0 grams per brake horsepower-hour (2.2 grams per megajoule), as measured under transient operating conditions.

(iii) For *methanol-fueled Otto-cycle heavy-duty engines* intended for use in all vehicles, except as provided in paragraph (a)(3) of this paragraph.

(A) *Organic Material Hydrocarbon Equivalent.* 1.1 gram per brake horsepower-hour (0.41 gram per megajoule), as measured under transient operating conditions.

(B) *Carbon monoxide.* (*1*) 14.4 grams per brake horsepower-hour (5.36 grams per megajoule), as measured under transient operating conditions.

(*2*) 0.50 percent of exhaust gas flow at curb idle.

(C) *Oxides of nitrogen.* 6.0 grams per brake horsepower-hour (2.2 grams per megajoule), as measured under transient operating conditions.

(iv) For *methanol-fueled Otto-cycle heavy-duty engines* intended for use only in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 lbs.

(A) *Organic Material Hydrocarbon Equivalent.* 1.9 grams per brake horsepower-hour (0.71 gram per megajoule), as measured under transient operating conditions.

(B) *Carbon monoxide.* (*1*) 37.1 grams per brake horsepower-hour (13.8 grams per megajoule), as measured under transient operating conditions.

(*2*) 0.50 percent of exhaust gas flow at curb idle.

(C) *Oxides of nitrogen.* 6.0 grams per brake horsepower-hour (2.2 grams per megajoule), as measured under transient operating conditions.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over the operating schedule set forth in paragraph (f)(1) of Appendix I to this part, and measured and calculated in accordance with the procedures set forth in Subpart N or P.

(3)(i) A manufacturer may certify one or more gasoline-fueled Otto-cycle heavy-duty engine configurations intended for use in all vehicles to the emission standards set forth in paragraph (a)(1)(ii) of this section: *Provided,* that the total model year sales of such configuration(s) being certified to the emission standards in paragraph (a)(1)(ii) of this section represent no more than 5 percent of total model year sales of all gasoline-fueled Otto-cycle heavy-duty engines intended for use in vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds by the manufacturer.

(ii) A manufacturer may certify one or more methanol-fueled Otto-cycle heavy-duty engine configurations intended for use in all vehicles to the emission standards set forth in paragraph (a)(1)(iv) of this section: *Provided*, that the total model year sales of such configuration(s) being certified to the emission standards in paragraph (a)(1)(iv) of this section represent no more than 5 percent of total model year sales of all methanol-fueled Otto-cycle heavy-duty engines intended for use in vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds by the manufacturer.

(iii) The configurations certified to the emission standards of paragraphs (a)(1)(ii) and (iv) of this section under the provisions of paragraphs (a)(3)(i) and (ii) of this section shall still be required to meet the evaporative emission standards set forth in paragraphs (b)(1)(i) (b)(2)(i) and (b)(3)(i) of this section.

(b) *Evaporative emissions* from 1990 and later model year heavy-duty vehicles shall not exceed (compliance with these standards is optional for 1990 model year methanol-fueled engines):

(1) *Hydrocarbons (for vehicles equipped with gasoline-fueled engines).* (i) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 lbs, 3.0 grams per test.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 14,000 lbs, 4.0 grams per test.

(2) *Organic Material Hydrocarbon Equivalent (for vehicles equipped with methanol-fueled engines).* (i) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 lbs, 3.0 grams per test.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 14,000 lbs, 4.0 grams per test.

(3)(i) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 lbs, the standards set forth in paragraphs (b)(1) and (b)(2) of this section refer to a composite sample of evaporative emissions collected under the conditions set forth in Subpart M and measured in accordance with those procedures.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 26,000 lbs, the standards set forth in paragraphs (b)(1)(ii) and (b)(2)(ii) of this section refer to the manufacturer's engineering design evaluation using good engineering practice (a statement of which is required in § 86.090-23(b)(4)(ii)).

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1990 or later model year Otto-cycle heavy-duty engine.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subpart N or P of this part to ascertain that such test engines meet the requirements of paragraphs (a) and (c) of this section.

[52 FR 47867, Dec. 16, 1987, as amended at 54 FR 14463, Apr. 11, 1989]

§ 86.090–11 Emission standards for 1990 and later model year diesel heavy-duty engines.

(a)(1) Exhaust emissions from new 1990 and later model year diesel heavy-duty engines shall not exceed the following:

(i)(A) *Hydrocarbons (for petroleum-fueled diesel engines).* 1.3 grams per brake horsepower-hour (0.48 gram per megajoule), as measured under transient operating conditions.

(B) *Organic Material Hydrocarbon Equivalent (for methanol-fueled diesel engines).* 1.3 grams per brake horsepower-hour (0.48 gram per megajoule), as measured under transient operating conditions.

(ii) *Carbon monoxide.* (A) 15.5 grams per brake horsepower-hour (5.77 grams per megajoule), as measured under transient operating conditions.

(B) 0.50 percent of exhaust gas flow at curb idle (methanol-fueled diesel only).

(iii) *Oxides of nitrogen.* 6.0 grams per brake horsepower-hour (2.2 grams per megajoule), as measured under transient operating conditions.

(iv) *Particulate.* For diesel engines, 0.60 gram per brake horsepower-hour (0.22 gram per megajoule), as measured under transient operating conditions.

(2) The standards set forth in paragraph (a)(1) of this section refer to the

exhaust emitted over the operating schedule set forth in paragraph (f)(2) of Appendix I to this part, and measured and calculated in accordance with the procedures set forth in Subpart N of this part, except as noted in § 86.088-23(c)(2) (i) and (ii).

(b)(1) The opacity of smoke emission from new 1990 and later model year diesel heavy-duty engines shall not exceed:

(i) 20 percent during the engine acceleration mode.

(ii) 15 percent during the engine lugging mode.

(iii) 50 percent during the peaks in either mode.

(2) The standards set forth in paragraph (b)(1) of this section refer to exhaust smoke emissions generated under the conditions set forth in Subpart I of this part and measured and and calculated in accordance with those procedures.

(3) *Evaporative emissions* (total of non-oxygenated hydrocarbons plus methanol) from 1990 and later model year heavy-duty vehicles equipped with methanol-fueled diesel engines shall not exceed:

(i) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 lbs., 3.0 grams per test.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 14,000 lbs., 4.0 grams per test.

(4)(i) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 lbs., the standards set forth in paragraph (b)(3) of this section refer to a composite sample of evaporative emissions collected under the conditions set forth in Subpart M and measured in accordance with those procedures.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 26,000 lbs., the standard set forth in paragraph (b)(3)(ii) of this section refers to the manufacturers' engineering design evaluation using good engineering practice (a statement of which is required in § 86.090-23(b)(4)(ii)).

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1990 or later model year methanol-fueled diesel, or any naturally-aspirated diesel heavy-duty engine. For petroleum-fueled diesel engines only, this provision does not apply to engines using turbochargers, pumps, blowers, or superchargers for air induction.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subpart I or N of this part to ascertain that such test engines meet the requirements of paragraphs (a), (b), and (c) of this section.

[52 FR 47867, Dec. 16, 1987, as amended at 54 FR 14465, Apr. 11, 1989]

§ 86.090-14 Small-volume manufacturers certification procedures.

(a) The small-volume manufacturers certification procedures described in paragraphs (b) and (c) of this section are optional. Small-volume manufacturers may use these optional procedures to demonstrate compliance with the general standards and specific emission requirements contained in this subpart.

(b)(1) The optional small-volume manufacturers certification procedures apply to light-duty vehicles, light-duty trucks, and heavy-duty engines produced by manufacturers with U.S. sales (for the model year in which certification is sought) of fewer than 10,000 units (light-duty vehicles, light-duty trucks, and heavy-duty engines combined).

(2) For the purpose of determining the applicability of paragraph (b)(1) of this section, where there is more than one importer or distributor of vehicles and/or engines manufactured by the same person, the sales the Administrator shall use shall be the aggregate of the projected or actual sales of those vehicles and/or engines by all of the importers and distributors.

(c) Small-volume manufacturers shall demonstrate compliance with the applicable sections of this subpart as follows:

(1) Sections 86.090-1, 86.088-2, 86.090-3, 86.084-4, 86.090-5, 86.078-6, 86.078-7, and 86.090-8 through 86.090-11 are applicable.

(2) Section 86.080-12 is not applicable.

(3) Sections 86.085-13, 86.090-14, 86.084-15, and 86.085-20 are applicable.

(4) Small-volume manufacturers shall include in its records all of the information that EPA requires in § 86.090-21. This information will be considered part of the manufacturer's application for certification. However, the manufacturer is not required to submit the information to the Administrator unless the Administrator requests it.

(5) Section 86.085-22 is applicable except as noted below.

(i) Small-volume light-duty vehicle and light-duty truck manufacturers may satisfy the requirements of paragraph (e) of § 86.085-22 by including a statement of compliance on adjustable parameters in the application for certification. In the statement of compliance the manufacturer shall state that the limits, stops, seals, or other means used to inhibit adjustment have been designed to accomplish their intended purpose based on good engineering practice and past experience. If the vehicle parameter is adjustable the vehicle must meet emission standards with the parameter set any place within the adjustable range (reference § 86.090-21).

(ii) Paragraphs (a), (b), (c), and (d) of § 86.085-22 are not applicable.

(6) Section 86.090-23 is applicable.

(7) Section 86.085-24 is applicable except as noted below.

(i) Small-volume manufacturers may satisfy the requirements of paragraphs (b) and (c) of § 86.085-24 by:

(A) Selecting emission-data test vehicles (engines) by the worst case emissions criteria as follows:

(*1*) *Light-duty vehicles and light-duty trucks.* The test vehicle shall be selected based on the following criteria: The manufacturer shall select the heaviest (including options) vehicle within the family. Then within that vehicle it shall select, in the order listed, the largest frontal area, largest displacement, the highest numerical axle ratio with the largest tire offered in the engine family, and the maximum fuel flow calibration.

(*2*) *Heavy-duty Otto-cycle engines.* The manufacturer shall select the worst case emission-data engine first based on the largest displacement within the engine family. Then within the largest displacement the manufacturer shall select, in the order listed, highest fuel flow at the speed of maximum rated torque, the engine with the most advance spark timing, no EGR or lowest EGR flow, and no air pump or lowest actual flow air pump.

(*3*) *Heavy-duty diesel engines.* The manufacturer shall select in each engine family the worst case emission data engine based on the highest fuel feed per stroke, primarily at the speed of maximum rated torque and secondarily at rated speed.

(B) Testing light-duty vehicle or light-duty truck emission-data vehicles at any service accumulation distance less than 6,436 kilometers (4,000 miles) or heavy-duty engine emission-data engines at any service accumulation time less than 125 hours.

(C) Using assigned deterioration factors that the Administrator determines and prescribes. However, the manufacturer may, at its option, accumulate miles (hours) on a durability-data vehicle (engine) and complete emission tests for the purpose of establishing its own deterioration factor.

(ii) Paragraphs (d) and (e) of § 86.085-24 are not applicable.

(8) Section 86.090-25 is applicable to durability-data light-duty vehicles, light-duty trucks, and heavy-duty engines if the manufacturer does not use assigned deterioration factors.

(9) Sections 86.084-26 and 86.085-27 are not applicable.

(10) Sections 86.090-28 and 86.090-29 are applicable.

(11)(i) Section 86.090-30 of this subpart is applicable, except for paragraphs (a)(2) and (b) of that section. In the place of these paragraphs, small-volume manufacturers shall comply with paragraphs (c)(11) (ii) through (v) of this section.

(ii) Small-volume manufacturers shall submit an application for certification containing the following:

(A) The names, addresses, and telephone numbers of the persons the manufacturer authorizes to communicate with us.

(B) A brief description of the vehicles (or engines) covered by the certificate (the manufacturers' sales data book or advertising, including specifications, may satisfy this requirement for most manufacturers). The description shall include, as a minimum, the following items as applicable:

(*1*) Engine families and vehicle (or engine) configurations.

(*2*) Vehicle or engine models to be listed on the certificate of conformity.

(*3*) The test weight and horsepower setting for each vehicle or engine configuration.

(*4*) Projected sales.

(*5*) Combustion cycle.

(*6*) Cooling mechanism.

(*7*) Number of cylinders.

(*8*) Displacement.

(*9*) Fuel system type.

(*10*) Number of catalytic converters, volume, and composition.

(*11*) Method of air aspiration.

(*12*) Thermal reactor characteristics.

(*13*) Suppliers' and/or manufacturer's name and model number of any emission-related items identified in paragraphs (c)(11)(ii)(B) (*1*) through (*12*) of this section, if purchased from a supplier or manufacturer who uses the items in its own certified vehicles(s) or engine(s).

(*14*) A list of emission component part numbers.

(*15*) Drawings, calibration curves, and descriptions of emission related components, including those components regulated under paragraph (e) of § 86.085-22, and schematics of hoses and other devices connecting these components.

(*16*) Vehicle adjustments or modifications necessary for light duty trucks to assure that they conform to high altitude standards.

(*17*) A description of the light-duty vehicles and light-duty trucks that are exempted from either the low- or high-altitude emission standards, as applicable.

(C) The results of all emission tests the manufacturer performs to demonstrate compliance with the applicable standards.

(D)(*1*) The following statement signed by the authorized representative of the manufacturer: "The vehicles (or engines) described herein have been tested in accordance with [list of the applicable Subparts A, B, D, I, N, or P] of Part 86, Title 40, United States Code of Federal Regulations, and on the basis of those tests are in conformance with that subpart. All of the data and records required by that subpart are on file and are available for inspection by the EPA Administrator. We project the total U.S. sales of vehicles (engines) subject to this subpart to be fewer than 10,000 units."

(*2*) A statement as required by and contained in paragraph (c)(5) of § 86.090-14 signed by the authorized representative of the manufacturer.

(*3*) A statement that the vehicles or engines described in the manufacturers application for certification are not equipped with auxiliary emission control devices which can be classified as a defeat device as defined in § 86.084-2.

(*4*) A statement of compliance with section 206(a)(3) of the Clean Air Act.

(*5*) A statement that, based on the manufacturer's engineering evaluation and/or emission testing, the light-duty vehicles comply with emission standards at high altitude unless exempt under paragraph (h) of § 86.090-8.

(*6*) A statement that, based on the manufacturers engineering evaluation and/or emission testing, the light-duty trucks sold for principle use at designated high-altitude locations comply with the high-altitude emission requirements and that all other light-duty trucks are at least capable of being modified to meet high altitude standards unless exempt under paragraph (g)(2) of § 86.090-9.

(iii) If the manufacturer meets requirements of this subpart, the Administrator will issue a certificate of conformity for the vehicles described in the application for certification.

(iv) The certificate will be issued for such a period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any vehicle or engine covered by the certificate will meet the requirements of the Act and of this subpart.

(v)(A) If, after a review of the statements and descriptions submitted by the manufacturer, the Administrator determines that the manufacturer has not met the applicable requirements, the Administrator shall notify the manufacturer in writing, setting forth the basis for his determination. The manufacturer may request a hearing on the Administrator's determination.

(B) If the manufacturer does not request a hearing or present the required information the Administrator will deny certification.

(12) Sections 86.079-31 and 86.079-32 are not applicable

(13) Under § 86.079-33, small-volume manufacturers are covered by the following:

(i) Small-volume manufacturers may make production changes (running changes) without receiving the Administrator's prior approval. The manufacturer shall assure (by conducting emission tests as it deems necessary) that the affected vehicles (engines) remain in compliance with the requirements of this part.

(ii) The manufacturer shall notify the Administrator within seven days after implementing any production related change (running change) that would affect vehicle emissions. This notification shall include any changes to the information required under paragraph (c)(11)(ii) of this section. The manufacturer shall also amend as necessary its records required under paragraph (c)(4) of this section to conform with the production design change.

(14) Section 86.082-34 is not applicable.

(15) Sections 86.090-35, 86.079-36, 86.082-37, 86.087-38, and 86.084-39 are applicable.

[54 FR 14466, Apr. 11, 1989]

§ 86.090–21 Application for certification.

(a) A separate application for a certificate of conformity shall be made for each set of standards (or family emission limits, as appropriate) and each class of new motor vehicles or new motor vehicle engines. Such application shall be made to the Administrator by the manufacturer and shall be updated and corrected by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1)(i) Identification and description of the vehicles (or engines) covered by the application and a description of their engine (vehicles only), emission control system and fuel system components. This shall include a detailed description of each auxiliary emission control device (AECD) to be installed in or on any certification test vehicle (or certification test engine).

(ii)(A) The manufacturer shall provide to the Administrator in the application for certification:

(*1*) A list of those parameters which are physically capable of being adjusted (including those adjustable parameters for which access is difficult) and that, if adjusted to settings other than the manufacturer's recommended setting, may affect emissions;

(*2*) A specification of the manufacturer's intended physically adjustable range of each such parameter, and the production tolerances of the limits or stops used to establish the physically adjustable range;

(*3*) A description of the limits or stops used to establish the manufacturer's intended physically adjustable range of each adjustable parameter, or any other means used to inhibit adjustment;

(*4*) The nominal or recommended setting, and the associated production tolerances, for each such parameter.

(B) The manufacturer may provide, in the application for certification, information relating to why certain parameters are not expected to be adjusted in actual use and to why the physical limits or stops used to establish the physically adjustable range of each parameter, or any other means used to inhibit adjustment, are expected to be effective in preventing adjustment of parameters on in-use vehicles to settings outside the manufacturer's intended physically adjustable ranges. This may include results of any tests to determine the difficulty of gaining access to an adjustment or exceeding a limit as intended or recommended by the manufacturer.

(C) The Administrator may require to be provided detailed drawings and descriptions of the various emission related components, and/or hardware samples of such components, for the purpose of making his determination of which vehicle or engine parameter will be subject to adjustment for new certification and Selective Enforcement Audit testing and of the physically adjustable range for each such vehicle or engine parameter.

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles (or engines) for which certification is requested. The sales data shall also include the altitude of intended sale for light-duty trucks.

(3) A description of the test equipment and fuel proposed to be used.

(4)(i) For light-duty vehicles and light duty trucks, a description of the test procedures to be used to establish the evaporative emission deterioration factors required to be determined and supplied in § 86.090–23(b)(2).

(ii) For heavy duty vehicles equipped with gasoline-fueled or methanol-fueled engines, the Administrator does not assume that each evaporative emission family-evaporative emission control system combination will deteriorate in a unique manner during the useful life of the vehicle. The manufacturer shall therefore identify those evaporative emission deterioration factors which shall be applied to the various evaporative emission family-evaporative emission control system combinations which are expected to exhibit similar deterioration characteristics during the useful life of the vehicle.

(iii)(A) A description of the test procedures to be used to establish the durability data or the exhaust emission deterioration factors required to be determined and supplied in § 86.088–23(b)(1).

(B)(*1*) For engine families provided an alternative useful-life period under paragraph (f) of this section, a statement of that alternative period and a brief synopsis of the justification.

(*2*) For heavy-duty diesel engine families, a statement of the primary intended service class (light, medium, or heavy) and an explanation as to why that service class was selected. Each diesel engine family shall be certified under one primary intended service class only. After reviewing the guidance in § 86.085–2, the class shall be determined on the basis of which class best represents the majority of the sales of that engine family.

(C)(*1*) A statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(*2*) A description of vehicle adjustments or modifications necessary, if any, to assure that light-duty vehicles and light-duty trucks covered by a certificate of conformity conform to the regulations while being operated at any altitude locations, and a statement of the altitude at which the adjustments or modifications apply.

(D) At the option of the manufacturer, the proposed composition of the emission-data test fleet or (where applicable) the durability-data test fleet.

(5)(i)(A) If the manufacturer elects to participate in the particulate averaging program for diesel light-duty vehicles and/or diesel light-duty trucks, the application must list the family particulate emission limit and the projected U.S. production volume of the family for the model year.

(B) The manufacturer shall choose the level of the family particulate emission limits, accurate to one-hundredth of a gram per mile.

(C) The manufacturer may at any time during production elect to change the level of any family diesel particulate emission limit(s) by submitting the new limit(s) to the Administrator and by demonstrating compliance with the limit(s) as described in § 86.085–2 and § 86.088–28(b)(5)(i).

(ii)(A) If the manufacturer elects to participate in the NO_x averaging program for light-duty trucks, the application must list the family NO_x emission limit and the projected U.S. production volume of the family for the model year.

(B) The manufacturer shall choose the level of the family NOx emission limits, accurate to one-tenth of a gram per mile.

(C) The manufacturer may at any time during production elect to change the level of any family NO_x emission limit(s) by submitting the new limits to the Administrator and by demonstrating compliance with the limit(s) as described in § 86.088-2 and § 86.088-28(b)(5)(ii).

(6)(i) For Otto-cycle heavy-duty engines, the application must state whether the engine family is being certified for use in all vehicles regardless of their Gross Vehicle Weight Rating (see § 86.088-10 (a)(1)(i) and (a)(3)(i)), or, only for use in vehicles with a Gross Vehicle Weight Rating greater than 14,000 pounds.

(ii) If the engine family is being certified for use in all vehicles and, is being certified to the emission standards applicable to Otto-cycle heavy-duty engines for use only in vehicles with a Gross Vehicle Weight Rating over 14,000 pounds under the provisions of paragraph (a)(3) of § 86.088-10, then the application must also attest that the engine family, together with all other engine families being certified under the provisions of paragraph (a)(3) of § 86.088-10, represent no more than 5 percent of model year sales of the manufacturer of all Otto-cycle heavy duty engines for use in vehicles with Gross Vehicle Weight Ratings of up to 14,000 pounds.

(iii)(A) A description of the test procedures to be used to establish the durability data or the exhaust emission deterioration factors required to be determined and supplied in § 86.088-23(b)(1).

(B)(*1*) A statement of the useful life of use of each light-duty truck engine family and heavy-duty engine family.

(*2*) For engine families provided an alternative useful life period under paragraph (f) of this section, a statement of that alternative period and a brief synopsis of the justification.

(*3*) For heavy-duty diesel engine families, a statement of the primary intended service class (light, medium, or heavy) and an explanation as to why that service class was selected. Each diesel engine family shall be certified under one primary intended service class only. After reviewing the guidance in § 86.085-2, the class shall be determined on the basis of which class best represents the majority of the sales of that engine family.

(7) For each light-duty vehicle engine family, a statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance and the equipment required.

(8) For each light-duty vehicle engine family, the proposed composition of the emission-data test fleet and the durability-data test fleet.

(c) Complete copies of the application and of any amendments thereto, and all notifications under § 86.079-32, § 86.079-33, and § 86.082-84 shall be submitted in such multiple copies as the Administrator may require.

(d) Incomplete light-duty trucks shall have a maximum completed curb weight and maximum completed frontal area specified by the manufacturer.

(e) For vehicles equipped with gasoline-fueled or methanol-fueled heavy-duty engines, the manufacturer shall specify a maximum nominal fuel tank capacity for each evaporative emission family-evaporative emission control system combination.

(f) Light-duty truck and heavy-duty engine manufacturers who believe that the useful life periods of § 86.085-2 are significantly unrepresentative for one or more engine families (either too long or too short), may petition the Administrator to provide an alternative useful-life period. This petition must include the full rationale behind the request together with any supporting data and other evidence. Based on this or other information the Administrator may assign an alternative useful-life period. Any petition should be submitted in a timely manner, to allow adequate time for a thorough evaluation.

[54 FR 14468, Apr. 11, 1989]

§ 86.090-22 Approval of application for certification; test fleet selections; determinations of parameters subject to adjustment for certification and Selective Enforcement Audit, adequacy of limits, and physically adjustable ranges.

(a) After a review of the application for certification and any other information which the Administrator may require, the Administrator may approve the application and select a test fleet in accordance with § 86.090-24.

(b) The Administrator may disapprove in whole or in part an application for certification for reasons including incompleteness, inaccuracy, inappropriate proposed mileage (or service) accumulation procedures, test equipment, or fuel, and incorporation of defeat devices in vehicles (or on engines) described by the application.

(c) Where any part of an application is rejected, the Administrator shall notify the manufacturer in writing and set forth the reasons for such rejection. Within 30 days following receipt of such notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If, after the review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078-6 with respect to such issue.

(d)(1) The Administrator does not approve the test procedures for establishing the evaporative emission deterioration factors for light-duty vehicles and light-duty trucks. The manufacturer shall submit the procedures as required in § 86.090-21(b)(4)(i) prior to the Administrator's selection of the test fleet under § 86.090-24(b)(1) and if such procedures will involve testing of durability-data vehicles selected by the Administrator or elected by the manufacturer under § 86.090-24(c)(1), prior to initiation of such testing.

(2) *Light-duty trucks and heavy-duty engines only.* The Administrator does not approve the test procedures for establishing exhaust emission deterioration factors. The manufacturer shall submit these procedures and determinations as required in § 86.090-21(b)(4)(iii) prior to determining the deterioration factors.

(3) *Heavy-duty vehicles equipped with gasoline-fueled or methanol-fueled engines only.* The Administrator does not approve the test procedures for establishing the evaporative emission deterioration factors. The test procedure will conform to the requirements in § 86.090-23(b)(3).

(e) When the Administrator selects emission-data vehicles for the test fleet, he will at the same time determine those vehicle or engine parameters which will be subject to adjustment for certification, Selective Enforcement Audit and Production Compliance Audit testing, the adequacy of the limits, stops, seals, or other means used to inhibit adjustment, and the resulting physically adjustable ranges for each such parameter and notify the manufacturer of his determinations.

(1)(i) Except as noted in paragraph (e)(1)(iv) of this section, the Administrator may determine to be subject to adjustment the idle fuel-air mixture parameter on Otto-cycle vehicles (or engines) (carbureted or fuel-injected); the choke valve action parameter(s) on carbureted, Otto-cycle vehicles (or engines); or any parameter on any vehicle (or engine) (Otto-cycle or diesel) which is physically capable of being adjusted, may significantly affect emissions, and was not present on the manufacturer's vehicles (or engines) in the previous model year in the same form and function.

(ii) The Administrator may, in addition, determine to be subject to adjustment any other parameters on any vehicle or engine which is physically capable of being adjusted and which may significantly affect emissions. However, the Administrator may do so only if he has previously notified the manufacturer that he might do so and has found, at the time he gave this notice, that the intervening period would be adequate to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period. In no event will this notification be given later than September 1 of the calendar year two years prior to the model year.

(iii) In determining the parameters subject to adjustment the Administrator will consider the likelihood that, for each of the parameters listed in paragraphs (e)(1)(i) and (e)(1)(ii) of this section, settings other than the manufacturer's recommended setting will occur on in-use vehicles (or engines). In determining likelihood, the Administrator may consider such factors as, but not limited to, information contained in the preliminary application, surveillance information from similar in-use vehicles (or engines), the difficulty and cost of gaining access to an adjustment, damage to the vehicle (or engine) if an attempt is made to gain such access and the need to replace parts following such attempt, and the effect of settings other than the manufacturer's recommended setting on vehicle (or engine) performance characteristics including emission characteristics.

(iv) Manual chokes of heavy-duty engines only will not be considered a parameter subject to adjustment under the parameter adjustment requirements.

(2)(i) The Administrator shall determine a parameter to be adequately inaccessible or sealed if:

(A) In the case of an idle mixture screw, the screw is recessed within the carburetor casting and sealed with lead, thermosetting plastic, or an inverted elliptical spacer or sheared off after adjustment at the factory, and the inaccessibility is such that the screw cannot be accessed and/or adjusted with simple tools in one-half hour or for $20 (1978 dollars) or less.

(B) In the case of a choke bimetal spring, the plate covering the bimetal spring is riveted or welded in place, or held in place with nonreversible screws.

(C) In the case of a parameter which may be adjusted by elongating or bending adjustable members (e.g., the choke vacuum break), the elongation of the adjustable member is limited by design or, in the case of a bendable member, the member is constructed of a material which when bent would return to its original shape after the force is removed (plastic or spring steel materials).

(D) In the case of any parameter, the manufacturer demonstrates that adjusting the parameter to settings other than the manufacturer's recommended setting takes more than one-half hour or costs more than $20 (1978 dollars).

(ii) The Administrator shall determine a physical limit or stop to be an adequate restraint on adjustability if:

(A) In the case of a threaded adjustment, the threads are terminated, pinned or crimped so as to prevent additional travel without breakage or need for repairs which take more than one-half hour or cost more than $20 (1978 dollars).

(B) The adjustment is ineffective at the end of the limits of travel regardless of additional forces or torques applied to the adjustment.

(C) The manufacturer demonstrates that travel or rotation limits cannot be exceeded with the use of simple and inexpensive tools (screwdriver, pliers, open-end or box wrenches, etc.) without incurring significant and costly damage to the vehicle (or engine) or control system or without taking more than one-half hour or costing more than $20 (1978 dollars).

(iii) If manufacturer service manuals or bulletins describe routine procedures for gaining access to a parameter or for removing or exceeding a physical limit, stop, seal or other means used to inhibit adjustment, or if surveillance data indicate that gaining access, removing, or exceeding is likely, paragraphs (e)(2)(i) and (e)(2)(ii) of this section shall not apply for that parameter.

(iv) In determining the adequacy of a physical limit, stop, seal, or other means used to inhibit adjustment of a parameter not covered by paragraph (e)(2)(i) or (e)(2)(ii) of this section, the Administrator will consider the likelihood that it will be circumvented, removed, or exceeded on in-use vehicles. In determining likelihood, the Administrator may consider such factors as, but not limited to, information contained in the preliminary application; surveillance information from similar in-use vehicles (or engines); the difficulty and cost of circumventing, removing, or exceeding the limit, stop, seal, or other means; damage to the vehicle (or engine) if an attempt is made to circumvent, remove, or exceed it and the need to replace parts following such attempt; and the effect of settings beyond the limit, stop, seal, or other means on vehicle (or engine) performance characteristics other than emission characteristics.

(3) The Administrator shall determine two physically adjustable ranges for each parameter subject to adjustment:

(i)(A) In the case of a parameter determined to be adequately inaccessible or sealed, the Administrator may include within the physically adjustable range applicable to testing under this subpart (certification testing) all settings within the production tolerance associated with the nominal setting for that parameter, as specified by the manufacturer in the preliminary application for certification.

(B) In the case of other parameters, the Administrator shall include within this range all settings within physical limits or stops determined to be adequate restraints on adjustability. The Administrator may also include the production tolerances on the location of these limits or stops when determining the physically adjustable range.

(ii)(A) In the case of a parameter determined to be adequately inaccessible or sealed, the Administrator shall include within the physically adjustable range applicable to testing under Subpart G or K (Selective Enforcement Audit and Production Compliance Audit) only the actual settings to which the parameter is adjusted during production.

(B) In the case of other parameters, the Administrator shall include within this range all settings within physical limits or stops determined to be adequate restraints on adjustability, as they are actually located on the test vehicle (or engine).

(f)(1) If the manufacturer submits the information specified in § 86.090-21(b)(1)(ii) in advance of its full preliminary application for certification, the Administrator shall review the information and make the determinations required in paragraph (e) of this section within 90 days of the manufacturer's submittal.

(2) The 90-day decision period is exclusive of the elapsed time during which EPA may request additional information from manufacturers regarding an adjustable parameter and the receipt of the manufacturers' response(s).

(g) Within 30 days following receipt of notification of the Administrator's determinations made under paragraph (e) of this section, the manufacturer may request a hearing on the Administrator's determinations. The request shall be in writing, signed by an authorized representative of the manufacturer, and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If, after review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078-6 with respect to such issue.

[54 FR 14470, Apr. 11, 1989]

§ 86.090–23 Required data.

(a) The manufacturer shall perform the tests required by the applicable test procedures, and submit to the Administrator the following information: *Provided, however*, that if requested by the manufacturer, the Administrator may waive any requirement of this section for testing of vehicles (or engines) for which emission data are available or will be made available under the provisions of § 86.090-29.

(b)(1)(i) Exhaust emission durability data on such light-duty vehicles tested in accordance with applicable test procedures and in such numbers as specified, which will show the performance of the systems installed on or incorporated in the vehicle for extended mileage, as well as a record of all pertinent maintenance performed on the test vehicles.

(ii) Exhaust emission deterioration factors for light-duty trucks and heavy-duty engines, and all test data that are derived from the testing described under § 86.090-21(b)(4)(iii)(A), as well as a record of all pertinent maintenance. Such testing shall be designed and conducted in accordance with good engineering practice to assure that the engines covered by a certificate issued under § 86.090-30 will meet the emission standards (or family emission limits, as appropriate) in § 86.090-9, § 86.090-10, or § 86.090-11 as appropriate, in actual use for the useful life of the engine.

(2) For light-duty vehicles and light-duty trucks, evaporative emission deterioration factors for each evaporative emission family-evaporative emission control system combination and all test data that are derived from testing described under § 86.090-21(b)(4)(i) designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.090-30 will meet the evaporative emission standards in § 86.090-8 or § 86.090-9, as appropriate, for the useful life of the vehicle.

(3) For heavy-duty vehicles equipped with gasoline-fueled or methanol-fueled engines, evaporative emission deterioration factors for each evaporative emission family-evaporative emission control system combination identified in accordance with § 86.090-21(b)(4)(ii). Furthermore, a statement that the test procedure(s) used to derive the deterioration factors includes, but need not be limited to, a consideration of the ambient effects of ozone and temperature fluctuations, and the service accumulation effects of vibration, time, and vapor saturation and purge cycling. The deterioration factor test procedure shall be designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.090-30 will meet the evaporative emission standards in § 86.090-10 and § 86.090-11 in actual use for the useful life of the engine. Furthermore, a statement that a description of the test procedure, as well as all data, analyses and evaluations, is available to the Administrator upon request.

(4)(i) For heavy-duty vehicles with a Gross Vehicle Weight Rating of up to 26,000 lbs. and equipped with gasoline-fueled or methanol-fueled engines, a written statement to the Administrator certifying that the manufacturer's vehicles meet the standards of § 86.090-10 or § 86.090-11 (as applicable) as determined by the provisions of § 86.090-28. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations, and other documents, on which the above statement is based, are available to the Administrator upon request.

(ii) For heavy-duty vehicles with a Gross Vehicle Weight Rating of greater than 26,000 lbs. and equipped with gasoline-fueled or methanol-fueled engines, a written statement to the Administrator certifying that the manufacturer's evaporative emission control systems are designed, using good engineering practice, to meet the standards of § 86.090-10 or § 86.090-11 (as applicable) as determined by the provisions of § 86.090-28. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations, and other documents, on which the above statement is based, are available to the Administrator upon request.

(c) Emission data: (1) Emission data, including in the case of methanol fuel, methanol, formaldehyde and organic material hydrocarbon equivalent on such vehicles tested in accordance with applicable test procedures and in such numbers as specified. These data shall include zero-mile data, if generated and emission data generated for certification as required under § 86.090-26(a)(3)(i) or § 86.090-26(a)(3)(ii). In lieu of providing emission data on idle CO emissions, smoke emissions or particulate emissions from methanol-fueled diesel certification vehicles the Administrator may, on request of the manufacturer, allow the manufacturer to demonstrate (on the basis of previous emission tests, development tests, or other information) that the engine will conform with the applicable emission standards of § 86.090-8 or § 86.090-9.

(2) Certification engines. (i) Emission data on such engines tested in accordance with applicable emission test procedures of this subpart and in such numbers as specified. These data shall include zero-hour data, if generated, and emission data generated for certification as required under § 86.090-26(c)(4). In lieu of providing emission data on idle CO emissions, smoke emissions or particulate emissions from methanol-fueled diesel certification vehicles, or on CO emissions from petroleum-fueled or methanol-fueled

diesel certification engines the Administrator may, on request of the manufacturer, allow the manufacturer to demonstrate (on the basis of previous emission tests, development tests, or other information) that the engine will conform with the applicable emission standards of § 86.090-11.

(ii) For heavy-duty diesel engines, a manufacturer may submit hot-start data only, in accordance with Subpart N, when making application for certification. However, for conformity SEA and recall testing by the Agency, both the cold-start and hot-start test data, as specified in Subpart N, will be included in the official results.

(d) A statement that the vehicles (or engines) for which certification is requested conform to the requirements in § 86.090-5(b), and that the descriptions of tests performed to ascertain compliance with the general standards in § 86.090-5(b), and the data derived from such tests, are available to the Administrator upon request.

(e)(1) A statement that the test vehicles (or test engines) with respect to which data are submitted to demonstrate compliance with the applicable standards (or family emission limits, as appropriate) of this subpart are in all material respects as described in the manufacturer's application for certification, have been tested in accordance with the applicable test procedures utilizing the fuels and equipment described in the application for certification and that on the basis of such tests the vehicles (or engines) conform to the requirements of this part. If such statements cannot be made with respect to any vehicle (or engine) tested, the vehicle (or engine) shall be identified, and all pertinent data relating thereto shall be supplied to the Administrator. If, on the basis of the data supplied and any additional data as required by the Administrator, the Administrator determines that the test vehicles (or test engine) was not as described in the application for certification or was not tested in accordance with the applicable test procedures utilizing the fuels and equipment as described in the application for certification, the Administrator may make the determination that the vehicle (or engine) does not meet the applicable standards (or family emission limits, as appropriate). The provisions of § 86.090-30(b) shall then be followed.

(2) For evaporative emission durability, or light-duty truck or heavy-duty engine exhaust emission durability, a statement of compliance with paragraph (b)(1)(ii), (b)(2), or (b)(3) of this section, as applicable.

(f) Additionally, manufacturers participating in the particulate averaging program for diesel light-duty vehicles and diesel light-duty trucks shall submit:

(1) In the application for certification, a statement that the vehicles for which certification is requested will not, to the best of the manufacturer's belief, when included in the manufacturer's production-weighted average emission level, cause the applicable particulate standard(s) to be exceeded.

(2) No longer than 90 days after the end of a given model year of production of engine families included in the diesel particulate averaging program, the number of vehicles produced in each engine family at each certified family diesel particulate emission limit, along with the resulting production-weighted average particulate emission level.

(g) Additionally, manufacturers participating in the NO_x averaging program for light-duty trucks shall submit:

(1) In the application for certification, a statement that the vehicles for which certification is requested will not, to the best of the manufacturer's belief, when included in the manufacturer's production-weighted average emission level, cause the applicable NO_x standard(s) to be exceeded.

(2) No longer than 90 days after the end of a given model year of production of engine families included in the light-duty truck NO_x averaging program, the number of vehicles produced in each engine family at each certified family NO_x emission limit, along with the resulting production-weighted average NO_x emission level.

[54 FR 14471, Apr. 11, 1989]

§ 86.090–24 Test vehicles and engines.

(a)(1) The vehicles or engines covered by an application for certification will be divided into groupings of engines which are expected to have similar emission characteristics throughout their useful life. Each group of engines with similar emission characteristics shall be defined as a separate engine family.

(2) To be classed in the same engine family, engines must be identical in all the following respects:

(i) The cylinder bore center-to-center dimensions.

(ii) [Reserved]

(iii) [Reserved]

(iv) The cylinder block configuration (air cooled or water cooled; L–6, 90° V–8, etc.).

(v) The location of the intake and exhaust valves (or ports).

(vi) The method of air aspiration.

(vii) The combustion cycle.

(viii) Catalytic converter characteristics.

(ix) Thermal reactor characteristics.

(x) Type of air inlet cooler (*e.g.*, intercoolers and after-coolers) for diesel heavy-duty engines.

(3)(i) Engines identical in all the respects listed in paragraph (a)(2) of this section may be further divided into different engine families if the Administrator determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(A) The bore and stroke.

(B) The surface-to-volume ratio of the nominally dimensioned cylinder at the top dead center positions.

(C) The intake manifold induction port size and configuration.

(D) The exhaust manifold port size and configuration.

(E) The intake and exhaust valve sizes.

(F) The fuel system.

(G) The camshaft timing and ignition or injection timing characteristics.

(ii) Light-duty trucks and heavy-duty engines produced in different model years and distinguishable in the respects listed in paragraph (a)(2) of this section shall be treated as belonging to a single engine family if the Administrator requires it, after determining that the engines may be expected to have similar emission deterioration characteristics.

(4) Where engines are of a type which cannot be divided into engine families based upon the criteria listed in paragraphs (a)(2) and (a)(3) of this section, the Administrator will establish families for those engines based upon those features most related to their emission characteristics. Engines that are eligible to be included in the same engine family based on the criteria in paragraphs (a)(2) and (a)(3)(i) of this section may be further divided into different engine families if the manufacturer determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(i) The dimension from the center line of the crankshaft to the center line of the camshaft.

(ii) The dimension from the center line of the crankshaft to the top of the cylinder block head face.

(iii) The size of the intake and exhaust valves (or ports).

(5) Gasoline-fueled and methanol-fueled light-duty vehicles and light-duty trucks covered by an application for certification will be divided into groupings which are expected to have similar evaporative emission characteristics throughout their useful life. Each group of vehicles with similar evaporative emission characteristics shall be defined as a separate evaporative emission family.

(6) For gasoline-fueled or methanol-fueled light-duty vehicles and light-duty trucks to be classed in the same evaporative emission family, vehicles must be similar with respect to:

(i) Type of vapor storage device (*e.g.* canister, air cleaner, crankcase).

(ii) Basic canister design.

(iii) Fuel system.

(7) Where vehicles are of a type which cannot be divided into evaporative emission families based on the criteria listed above, the Administrator will establish families for those vehicles based upon the features most related to their evaporative emission characteristics.

(8)(i) If the manufacturer elects to participate in the Alternative Durability Program, the engine families covered by an application for certification shall be grouped based upon similar engine design and emission control system characteristics. Each of these groups shall constitute a separate engine family group.

(ii) To be classed in the same engine family group, engine families must contain engines identical in all of the following respects:

(A) The combustion cycle.

(B) The cylinder block configuration (air-cooled or water-cooled; L-6, V-8, rotary, etc.).

(C) Displacement (engines of different displacement within 50 cubic inches or 15 percent of the largest displacement and contained within a multidisplacement engine family will be included in the same engine family group).

(D) Catalytic converter usage and basic type (noncatalyst, oxidation catalyst only, three-way catalyst equipped).

(9) Engine families identical in all respects listed in paragraph (a)(8) of this section may be further divided into different engine family groups if the Administrator determines that they are expected to have significantly different exhaust emission control system deterioration characteristics.

(10) A manufacturer may request the Administrator to include in an engine family group, engine families in addition to those grouped under the provisions of paragraph (a)(8) of this section. This request must be accompanied by information the manufacturer believes supports the inclusion of these additional engine families.

(11) A manufacturer may combine into a single engine family group those light-duty vehicle and light-duty truck engine families which otherwise meet the requirements of paragraphs (a)(8) through (a)(10) of this section.

(12) The vehicles covered by an application for certification equipped with gasoline-fueled or methanol-fueled heavy-duty engines will be divided into groupings of vehicles on the basis of physical features which are expected to affect evaporative emissions. Each group of vehicles with similar features shall be defined as a separate evaporative emission family.

(13) For vehicles equipped with gasoline-fueled or methanol-fueled heavy-duty engines to be classed in the same evaporative emission family, vehicles must be identical with respect to:

(i) Method of fuel/air metering (*i.e.*, carburetion versus fuel injection).

(ii) Carburetor bowl fuel volume, within a 10 cc range.

(14) For vehicles equipped with gasoline-fueled or methanol-fueled heavy-duty engines to be classed in the same evaporative emission control system, vehicles must be identical with respect to:

(i) Method of vapor storage.

(ii) Method of carburetor sealing.

(iii) Method of air cleaner sealing.

(iv) Vapor storage working capacity, within a 20 g range.

(v) Number of storage devices.

(vi) Method of purging stored vapors.

(vii) Method of venting the carburetor during both engine off and engine operation.

(viii) Liquid fuel hose material.

(ix) Vapor storage material.

(15) Where vehicles equipped with gasoline-fueled or methanol-fueled heavy-duty engines are types which cannot be divided into evaporative emission family-control system combinations based on the criteria listed above, the Administrator will establish evaporative emission family-control system combinations for those vehicles based on features most related to their evaporative emission characteristics.

(b) *Emission data*—(1) *Emission-data vehicles.* Paragraph (b)(1) of this section applies to light-duty vehicle and light-duty truck emission-data vehicles.

(i) Vehicles will be chosen to be operated and tested for emission data based upon engine family groupings. Within each engine family, one test vehicle will be selected based on the following criteria: The Administrator shall select the vehicle with the heaviest equivalent test weight (including options) within the family. Then within that vehicle the Administrator shall select, in the order listed, the highest road-load power, largest displacement, the transmission with the highest numerical final gear ratio (including overdrive), the highest numerical axle ratio offered in that engine family and the maximum fuel flow calibration.

(ii) The Administrator shall select one additional test vehicle from within each engine family. The vehicle selected shall be the vehicle expected to exhibit the highest emissions of those vehicles remaining in the engine family. If all vehicles within the engine family are similar the Administrator may waive the requirements of this paragraph.

(iii) Within an engine family and exhaust emission control system, the manufacturer may alter any emission-data vehicle (or other vehicles such as including current or previous model year emission-data vehicles, fuel economy data vehicles, and development vehicles provided they meet emission-data vehicles, protocol) to represent more than one selection under paragraphs (b)(1) (i), (ii), (iv), or (vii) of this section.

(iv) If the vehicles selected in accordance with paragraphs (b)(1) (i) and (ii) of this section do not represent each engine-system combination, then one vehicle of each engine-system combination not represented will be selected by the Administrator. The vehicle selected shall be the vehicle expected to exhibit the highest emissions of those vehicles remaining in the engine family.

(v) For high-altitude exhaust emission compliance for each engine family, the manufacturer shall follow one of the following procedures:

(A) The manufacturer will select for testing under high-altitude conditions the vehicle expected to exhibit the highest emissions from the nonexempt vehicles selected in accordance with § 86.090-24(b)(1) (ii), (iii), and (iv) of this section or,

(B) In lieu of testing vehicles according to paragraph (b)(1)(v)(A) of this section, a manufacturer may provide a statement in its application for certification that, based on the manufacturer's engineering evaluation of such high-altitude emission testing as the manufacturer deems appropriate,

(*1*) That all light-duty vehicles not exempt under § 86.090-8(h) comply with the emission standards at high-altitude, and

(*2*) That light-duty trucks sold for principal use at designated high-altitude locations comply with the high-altitude emission requirements, and that all light-duty trucks sold at low-altitude, which are not exempt under § 86.090-9(g)(2), are capable of being modified to meet high-altitude standards.

(vi) If 90 percent or more of the engine family sales will be in California, a manufacturer may substitute emission-data vehicles selected by the California Air Resources Board criteria for the selections specified in paragraphs (b)(1)(i), (ii), and (iv) of this section.

(vii)(A) Vehicles of each evaporative emission family will be divided into evaporative emission control systems.

(B) The Administrator will select the vehicle expected to exhibit the highest evaporative emissions, from within each evaporative family to be certified, from among the vehicles represented by the exhaust emission-data selections for the engine family, unless evaporative testing has already been completed on the vehicle expected to exhibit the highest evaporative emissions for the evaporative family as part of another engine family's testing.

(C) If the vehicles selected in accordance with paragraph (b)(1)(vii)(B) of this section do not represent each evaporative emission control system then the Administrator will select the highest expected evaporative emission vehicle from within the unrepresented evaporative system.

(viii) For high-altitude evaporative emission compliance for each evaporative emission family, the manufacturer shall follow one of the following procedures:

(A) The manufacturer will select for testing under high-altitude conditions the one nonexempt vehicle previously selected under paragraphs (b)(1)(vii) (B) or (C) of this section which is expected to have the highest level of evaporative emissions when operated at high altitude or

(B) In lieu of testing vehicles according to paragraph (b)(1)(viii)(A) of this section, a manufacturer may provide a statement in its application for certification that based on the manufacturer's engineering evaluation of such high-altitude emission testing as the manufacturer deems appropriate,

(*1*) That all light-duty vehicles not exempt under § 86.090–8(h) comply with the emission standards at high altitude and

(*2*) That light-duty trucks sold for principal use at designated high-altitude locations comply with the high-altitude emission requirements, and that all light-duty trucks sold at low altitude, which are not exempt under § 86.090–9(g)(2), are capable of being modified to meet high-altitude standards.

(ix) Vehicles selected under paragraph (b)(1)(v)(A) of this section may be used to satisfy the requirements of (b)(1)(viii)(A) of this section.

(x) *Light-duty trucks only:* (A) The manufacturer may reconfigure any of the low-altitude emission-data vehicles to represent the vehicle configuration required to be tested at high altitude.

(B) The manufacturer is not required to test the reconfigured vehicle at low altitude.

(2) *Otto-cycle heavy-duty emission-data engines.* Paragraph (b)(2) of this section applies to Otto-cycle heavy-duty engines.

(i) [Reserved]

(ii) [Reserved]

(iii) The Administrator shall select a maximum of two engines within each engine family based upon features indicating that they may have the highest emission levels of the engines in the engine family as follows:

(A) The Administrator shall select one emission-data engine first based on the largest displacement within the engine family. Then within the largest displacement the Administrator shall select, in the order listed, highest fuel flow at the speed of maximum rated torque, the engine with the most advanced spark timing, no EGR or lowest EGR flow, and no air pump or lowest actual flow air pump.

(B) The Administrator shall select one additional engine, from within each engine family. The engine selected shall be the engine expected to exhibit the highest emissions of those engines remaining in the engine family. If all engines within the engine family are similar the Administrator may waive the requirements of this paragraph.

(iv) If the engines selected in accordance with paragraphs (b)(2) (ii) and (iii) of this section do not represent each engine displacement-exhaust emission control system combination, then one engine of each engine displacement-exhaust emission control system combination not represented shall be selected by the Administrator.

(v) Within an engine family/displacement/control system, the manufacturer may alter any emission-data engine (or other engine including current or previous model year emission-data vehicles and development engines provided they meet the emission-data engines protocol) to represent more than one selection under paragraphs (b)(2)(iii) of this section.

(3) *Diesel heavy-duty emission-data engines.* Paragraph (b)(3) of this section applies to diesel heavy-duty emission-data vehicles.

(i) Engines will be chosen to be run for emission data based upon engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Engines of each engine family will be divided into groups based upon their exhaust emission control systems. One engine of each engine system combination shall be run for smoke emission data (diesel engines only) and gaseous emission data. Either the complete gaseous emission test or the complete smoke test may be conducted first. Within each combination, the engine that features the highest fuel feed per stroke, primarily at the speed of maximum rated torque and secondarily at rated speed, will usually be selected. If there are military engines with higher fuel rates than other engines in the same engine system combinations, then one military engine shall also be selected. The engine with the highest fuel feed per stroke will usually be selected.

(iii) The Administrator may select a maximum of one additional engine within each engine-system combination based upon features indicating that it may have the highest emission levels of the engines of that combination. In selecting this engine, the Administrator will consider such features as the injection system, fuel system, compression ratio, rated speed, rated horsepower, peak torque speed, and peak torque.

(iv) Within an engine family control system combination, the manufacturer may alter any emission-data engine (or other engine including current or previous model year emission-data vehicles and development engines provided they meet the emission-data engines' protocol) to represent more than one selection under paragraphs (b)(3) (ii) and (iii) of this section.

(c) *Durability data*—(1) *Light-duty vehicle durability-data vehicles.* Paragraph (c)(1) of this section applies to light-duty vehicle durability-data vehicles.

(i) A durability-data vehicle will be selected by the Administrator to represent each engine-system combination. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with that control-system combination in that engine family and will be designated by the Administrator as to transmission type, fuel system, inertia weight class, and test weight.

(ii) A manufacturer may elect to operate and test additional vehicles to represent any engine-system combination. The additional vehicles must be of the same engine displacement, transmission type, fuel system and inertia weight class as the vehicle selected for that engine-system combination in accordance with the provisions of paragraph (c)(1)(i) of this section. Notice of an intent to operate and test additional vehicles shall be given to the Administrator no later than 30 days following notification of the test fleet selection.

(2) *Light-duty trucks.* Paragraph (c)(2) of this section applies to vehicles, engines, subsystems, or components used to establish exhaust emission deterioration factors for light-duty trucks.

(i) The manufacturer shall select the vehicles, engines, subsystems, or components to be used to determine exhaust emission deterioration factors for each engine-family control system combination. Whether vehicles, engines, subsystems, or components are used, they shall be selected so that their emissions deterioration characteristics may be expected to represent those of in-use vehicles, based on good engineering judgment.

(ii) [Reserved]

(3) *Heavy-duty engines.* Paragraph (c)(3) of this section applies to engines, subsystems, or components used to establish exhaust emission deterioration factors for heavy-duty engines.

(i) The manufacturer shall select the engines, subsystems, or components to be used to determine exhaust emission deterioration factors for each engine-family control system combination. Whether engines, subsystems, or components are used, they shall be selected so that their emissions deterioration characteristics may be expected to represent those of in-use engines, based on good engineering judgment.

(ii) [Reserved]

(d) For purposes of testing under § 86.084-26 (a)(9) or (b)(11), the Administrator may require additional emission-data vehicles (or emission-data engines) and durability-data vehicles (light-duty vehicles only) identical in all material respects to vehicles (or engines) selected in accordance with paragraphs (b) and (c) of this section, *provided* that the number of vehicles (or engines) selected shall not increase the size of either the emission-data fleet or the durability-data fleet by more than 20 percent or one vehicle (or engine), whichever is greater.

(e)(1) Any manufacturer whose projected sales for the model year in which certification is sought is less than:

(i) 2,000 Otto-cycle light-duty vehicles, or

(ii) 2,000 diesel light-duty vehicles or

(iii) 2,000 Otto-cycle light-duty trucks, or

(iv) 2,000 diesel light-duty trucks, or

(v) 2,000 Otto-cycle heavy-duty engines, or

(vi) 2,000 diesel heavy-duty engines may request a reduction in the number of test vehicles (or engines) determined in accordance with the foregoing provisions of this section. The Administrator may agree to such lesser number as he determines would meet the objectives of this procedure.

(2) Any manufacturer may request to certify engine families with combined total sales of fewer than 10,000 light-duty vehicles, light-duty trucks, and heavy-duty engines utilizing assigned deterioration factors prescribed by the Administrator. The assigned deterioration factors shall be applied only to entire engine families.

(f) In lieu of testing an emission-data or durability-data vehicle (or engine) selected under paragraph (b) or (c) of this section, and submitting data therefore, a manufacturer may, with the prior written approval of the Administrator, submit exhaust emission data and/or fuel evaporative emission data, as applicable on a similar vehicle (or engine) for which certification has previously been obtained or for which all applicable data required under § 86.090-23 has previously been submitted.

(g)(1) This paragraph applies to light-duty vehicles and light-duty trucks, but does not apply to the production vehicles selected under paragraph (h) of this section.

(2)(i) Where it is expected that more than 33 percent of a carline, within an engine-system combination will be equipped with an item (whether that item is standard equipment or an option), the full estimated weight of that item shall be included in the curb weight computation for each vehicle available with that option in that carline, within that engine-system combination.

(ii) Where it is expected that 33 percent or less of the carline, within an engine-system, will be equipped with an item of (whether that item is standard equipment or an option), no weight for that item will be added in computing curb weight for any vehicle in that carline, within that engine-system combination, unless that item is standard equipment on the vehicle.

(iii) In the case of mutually exclusive options, only the weight of the heavier option will be added in computing curb weight.

(iv) Optional equipment weighing less than 3 pounds per item need not be considered.

(3)(i) Where it is expected that more than 33 percent of a carline, within an engine-system combination will be equipped with an item of (whether that item is standard equipment or an option) that can reasonably be expected to influence emissions, then such items shall actually be installed (unless excluded under paragraph (g)(3)(ii) of this section) on all emission data and durability data vehicles of that carline, within that engine-system combination, on which the items are intended to be offered in production. Items that can reasonably be expected to influence emissions are: air conditioning, power steering, power brakes and other items determined by the Administrator.

(ii) If the manufacturer determines by test data or engineering evaluation that the actual installation of the optional equipment required by paragraph (g)(3)(i) of this section does not affect the emissions or fuel economy values, the optional equipment need not be installed on the test vehicle.

(iii) The weight of the options shall be included in the design curb weight and also be represented in the weight of the test vehicles.

(iv) The engineering evaluation, including any test data, used to support the deletion of optional equipment from test vehicles, shall be maintained by the manufacturer and shall be made available to the Administrator upon request.

(4) Where it is expected that 33 percent or less of a carline, within an engine system combination will be equipped with an item of (whether that item is standard equipment or an option) that can reasonably be expected to influence emissions, that item shall not be installed on any emission data or durability data vehicles of that carline, within that engine-system combination, unless that item is standard equipment on the vehicle.

(h) Alternative Durability Program durability-data vehicles. This section applies to light-duty vehicle and light-duty truck durability-data vehicles selected under the Alternative Durability Program described in § 86.085-13.

(1) In order to update the durability data to be used to determine a deterioration factor for each engine family group, the Administrator will select durability-data vehicles from the manufacturer's production line. Production vehicles will be selected from each model year's production for those vehicles certified using the Alternative Durability Program procedures.

(i) The Administrator shall select the production durability-data vehicle designs from the designs that the manufacturer offers for sale. For each model year and for each engine family group, the Administrator may select production durability-data vehicle designs of equal number to the number of engine families within the engine family group, up to a maximum of three vehicles.

(ii) The production durability-data vehicles representing the designs selected in paragraph (h)(1)(i) of this section will be randomly selected from the manufacturer's production. The Administrator will make these random selections unless the manufacturer (with prior approval of the Administrator) elects to make the random selections.

(iii) The manufacturer may select additional production durability-data vehicle designs from within the engine family group. The production durability-data vehicles representing these designs shall be randomly selected from the manufacturer's production in accordance with paragraph (h)(1)(ii) of this section.

(iv) For each production durability-data vehicle selected under paragraph (h)(1) of this section, the manufacturer shall provide to the Administrator (before the vehicle is tested or begins service accumulation) the vehicle identification number. Before the vehicle begins service accumulation the manufacturer shall also provide the Administrator with a description of the durability-data vehicle as specified by the Administrator.

(v) In lieu of testing a production durability-data vehicle selected under paragraph (h)(1) of this section, and submitting data therefrom, a manufacturer may, with the prior written approval of the Administrator, submit exhaust emission data from a production vehicle of the same configuration for which all applicable data has previously been submitted.

(2) If, within an existing engine family group, a manufacturer requests to certify vehicles of a new design, engine family, emission control system, or with any other durability-related design difference, the Administrator will determine if the existing engine family group deterioration factor is appropriate for the new design. If the Administrator cannot make this determination or deems the deterioration factor not appropriate, the Administrator shall select preproduction durability-data vehicles under the provisions of paragraph (c) of this section. If vehicles are then certified using the new design, the Administrator may select production vehicles with the new design under the provisions of paragraph (h)(1) of this section.

(3) If a manufacturer requests to certify vehicles of a new design that the Administrator determines are a new engine family group, the Administrator shall select preproduction durability data vehicles under the provisions of paragraph (c) of this section. If vehicles are then certified using the new design, the Administrator may select production vehicles of that design under the provisions of paragraph (h)(1) of this section.

[54 FR 14474, Apr. 11, 1989]

§ 86.090–25 Maintenance.

(a) *Applicability.* This section applies to light-duty vehicles, light-duty trucks, and heavy-duty engines.

(1) Maintenance performed on vehicles, engines, subsystems, or components used to determine exhaust or evaporative emission deterioration factors is classified as either emission-related or non-emission-related and each of these can be classified as either scheduled or unscheduled. Further, some emission-related maintenance is also classified as critical emission-related maintenance.

(b) This section specifies emission-related scheduled maintenance for purposes of obtaining durability data and for inclusion in maintenance instructions furnished to purchasers of new motor vehicles and new motor vehicles engines under § 86.087–38.

(1) All emission-related scheduled maintenance for purposes of obtaining durability data must occur at the same mileage intervals (or equivalent intervals if engines, subsystems, or components are used) that will be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle or engine under § 86.088–35. This maintenance schedule may be updated as necessary throughout the testing of the vehicle/engine provided that no maintenance operation is deleted from the maintenance schedule after the operation has been performed on the test vehicle or engine.

(2) Any emission-related maintenance which is performed on vehicles, engines, subsystems, or components must be technologically necessary to assure in-use compliance with the emission standards. The manufacturer must submit data which demonstrate to the Administrator that all of the emission-related scheduled maintenance which is to be performed is technologically necessary. Scheduled maintenance must be approved by the Administrator prior to being performed or being included in the maintenance instructions provided to purchasers under § 86.087–38. As provided below, EPA has determined that emission-related maintenance at shorter intervals than that outlined in paragraphs (b)(3) and (b)(4) of this section is not technologically necessary to ensure in-use compliance. However, the Administrator may determine that maintenance even more restrictive (*e.g.*, longer intervals) than that listed in paragraphs (b)(3) and (b)(4) of this section is also not technologically necessary.

(3) For Otto-cycle light-duty vehicles, light-duty trucks and heavy duty engines, emission-related maintenance in addition to, or at shorter intervals than, the following will not be accepted as technologically necessary, except as provided in paragraph (b)(7) of this section.

(i)(A) The cleaning or replacement of light-duty vehicle or light-duty truck spark plugs at 30,000 miles of use and at 30,000 mile intervals thereafter.

(B) The cleaning or replacement of Otto-cycle heavy duty engine spark plugs at 25,000 miles (or 750 hours) of use and at 25,000 mile intervals (or 750-hour) intervals thereafter, for engines certified for use with unleaded fuel only.

(4) For diesel powered light-duty vehicles, light-duty trucks, and heavy-duty engines, emission-related maintenance in addition to, or at shorter intervals than, the following will not be accepted as technologically necessary, except as provided in paragraph (b)(7) of this section.

(i) For light-duty vehicles, the adjustment, cleaning, repair, or replacement of the following may not be performed within the 50,000-mile useful life of the vehicle:

(A) Exhaust gas recirculation system (including all related filters and control valves).

(B) Positive crankcase ventilation valve.

(C) Fuel injectors.

(D) Turbocharger.

(E) Electronic engine control unit and its associated sensors and actuators.

(F) Particulate trap or trap-oxidizer system (including related components).

(ii) For light-duty trucks and heavy-duty engines, the adjustment, cleaning, repair, or replacement of the following at 50,000 miles (or 1,500 hours) of use and at 50,000-mile (or 1,500-hour) intervals thereafter:

(A) Exhaust gas recirculation system (including all related filters and control valves).

(B) Positive crankcase ventilation valve.

(C) Fuel injector tips (cleaning *only*).

(iii) The following maintenance at 100,000 miles (or 3,000 hours) of use and at 100,000-mile (or 3,000-hour) intervals thereafter for light-duty trucks and light heavy-duty engines, or, at 150,000 miles (or 4,500 hours) of use and at 150,000-mile (or 4,500-hour) intervals thereafter for medium and heavy-duty engines: The adjustment, cleaning, repair, or replacement of:

(A) Fuel injectors.

(B) Turbocharger.

(C) Electronic engine control unit and its associated sensors and actuators.

(D) Particulate trap or trap-oxidizer system (including related components).

(5) [Reserved]

(6) (i) The Following components are currently defined as critical emission-related components:

(A) Catalytic converter.

(B) Air injection system components.

(C) Electronic engine control unit and its associated sensors (including oxygen sensor if installed) and actuators.

(D) Exhaust gas recirculation system (including all related filters and control valves).

(E) Positive crankcase ventilation valve.

(F) Evaporative emission control system components (excluding canister air filter).

(G) Particulate trap or trap-oxidizer system.

(ii) All critical emission-related scheduled maintenance must have a reasonable likelihood of being performed in-use. The manufacturer shall be required to show the reasonable likelihood of such maintenance being performed in-use, and such showing shall be made prior to the performance of the maintenance on the durability data vehicle. Critical emission-related scheduled maintenance items which satisfy one of the following conditions will be accepted as having a reasonable likelihood of the maintenance item being performed in-use:

(A) Data are presented which establish for the Administrator a connection between emissions and vehicle performance such that as emissions increase due to lack of maintenance, vehicle performance will simultaneously deteriorate to a point unacceptable for typical driving.

(B) Survey data are submitted which adequately demonstrate to the Administrator that, at an 80 percent confidence level, 80 percent of such engines already have this critical maintenance item performed in-use at the recommended interval(s).

(C) A clearly displayed visible signal system approved by the Administrator is installed to alert the vehicle driver that maintenance is due. A signal bearing the message "maintenance needed" or "check engine," or a similar message approved by the Administrator, shall be actuated at the appropriate mileage point or by component failure. This signal must be continuous while the engine is in operation, and not be easily eliminated without performance of the required maintenance. Resetting the signal shall be a required step in the maintenance operation. The method for resetting the signal system shall be approved by the Administrator.

(D) A manufacturer may desire to demonstrate through a survey that a critical maintenance item is likely to be performed without a visible signal on a maintenance item for which there is no prior in-use experience without the signal. To that end, the manufacturer may in a given model year market up to 200 randomly selected vehicles per critical emission-related maintenance item without such visible signals, and monitor the performance of the critical maintenance item by the owners to show compliance with paragraph (b)(6)(ii)(B) of this section. This option is restricted to two consecutive model years and may not be repeated until any previous survey has been completed. If the critical maintenance involves more than one engine family, the sample will be sales weighted to ensure that it is representative of all the families in question.

(E) The manufacturer provides the maintenance free of charge, and clearly informs the customer that the maintenance is free in the instructions provided under § 86.087-38.

(F) Any other method which the Administrator approves as establishing a reasonable likelihood that the critical maintenance will be performed in-use.

(iii) Visible signal systems used under paragraph (b)(6)(ii)(C) of this section are considered an element of design of the emission control system. Therefore, disabling, resetting, or otherwise rendering such signals inoperative without also performing the indicated maintenance procedure is a prohibited act under section 203(a)(3) of the Clean Air Act, as amended in August 1977 (42 U.S.C. 7522(a)(3)).

(7) *Changes to scheduled maintenance.* (i) For maintenance practices that existed prior to the 1980 model year, only the maintenance items listed in paragraphs (b)(3) and (b)(4) of this section are currently considered by EPA to be emission-related. The Administrator may, however, determine additional scheduled maintenance items that existed prior to the 1980 model year to be emission-related by announcement in a FEDERAL REGISTER Notice. In no event may this notification occur later than September 1 of the calendar year two years prior to the affected model year.

(ii) In the case of any new scheduled maintenance, the manufacturer must submit a request for approval to the Administrator for any maintenance that it wishes to recommend to purchasers and perform during durability determination. New scheduled maintenance is that maintenance which did not exist prior to the 1980 model year, including that which is a direct result of the implementation of new technology not found in production prior to the 1980 model year. The manufacturer must also include its recommendations as to the category (*i.e.*, emission-related or non-emission-related, critical or non-critical) of the subject maintenace and, for suggested emission-related maintenance, the maximum feasible maintenance interval. Such requests must include detailed evidence supporting the need for the maintenance requested, and supporting data or other substantiation for the recommended maintenance category and for the interval suggested for emission-related maintenance. Requests for new scheduled maintenance must be approved prior to the introduction of the new maintenance. The Administrator will then designate the maintenance as emission-related or non-emission-related. For maintenance items established as emission-related, the Administrator will further designate the maintenance as critical if the component which receives the maintenance is a critical component under paragraph (b)(6) of this section. For each maintenance item designated as emission-related, the Administrator will also establish a technologically necessary maintenance interval, based on industry data and any other information available to EPA. Designations of emission-related maintenance items, along with their identification as critical or non-critical, and establishment of technologically necessary maintenance intervals, will be announced in the FEDERAL REGISTER.

(iii) Any manufacturer may request a hearing on the Administrator's determinations in paragraph (b)(7) of this section. The request shall be in writing, and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If, after review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078-6 with respect to such issue.

(c) Non-emission-related scheduled maintenance which is reasonable and technologically necessary (*e.g.*, oil change, oil filter change, fuel filter change, air filter change, cooling system maintenance, adjustment of idle speed, governor, engine bolt torque, valve lash, injector lash, timing, etc.) may be performed on durability-data vehicles at the intervals recommended by the manufacturer to the ultimate purchaser.

(d) *Unscheduled maintenance on light-duty durability data vehicles.* (1) Unscheduled maintenance may be performed during the testing used to determine deterioration factors, except as provided in paragraphs (d)(2) and (d)(3) of this section, only under the following provisions:

(i) A fuel injector or spark plug may be changed if a persistent misfire is detected.

(ii) Readjustment of an Otto-cycle vehicle cold-start enrichment system may be performed if there is a problem of stalling.

(iii) Readjustment of the engine idle speed (curb idle and fast idle) may be performed in addition to that performed as scheduled maintenance under paragraph (c) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 rpm or more, or if there is a problem of stalling.

(2) Any other unscheduled vehicle, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement during testing to determine deterioration factors shall be performed only with the advance approval of the Administrator. Such approval will be given if the Administrator:

(i) Has made a preliminary determination that the part failure or system malfunction, or the repair of such failure or malfunction, does not render the vehicle or engine unrepresentative of vehicles or engines in-use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement; and,

(ii) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, engine stalling, overheating, fluid leakage, loss of oil pressure, excessive fuel consumption or excessive power loss. The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or vehicle/engine malfunction (*e.g.*, misfiring, stalling, black smoke), or an activation of an audible and/or visible signal, prior to the performance of any maintenance to which such overt indication or signal is relevant under the provisions of this section.

(3) Emission measurement may not be used as a means of determining the need for unscheduled maintenance under paragraph (d)(2) of this section, except under the following conditions:

(i) The Administrator may approve unscheduled maintenance on durability-data vehicles based upon a significant change in emission levels that indicates a vehicle or engine malfunction. In these cases the Administrator may first approve specific diagnostic procedures to identify the source of the problem. The Administrator may further approve of specific corrections to the problem after the problem has been identified. The Administrator may only approve the corrective action after it is determined that:

(A) The malfunction was caused by nonproduction build practices or by a previously undetected design problem,

(B) The malfunction will not occur in production vehicles or engines in-use, *and*

(C) The deterioration factor generated by the durability-data vehicle or engine will remain unaffected by the malfunction or by the corrective action (*e.g.*, the malfunction was present for only a short period of time before detection, replacement parts are functionally representative of the proper mileage or hours, etc.).

(ii) Following any unscheduled maintenance approved under paragraph (d)(3)(i) of this section, the manufacturer shall perform an after-maintenance emissions test. If the Administrator determines that the after-maintenance emission levels for any pollutant indicates that the deterioration factor is no longer representative of production, the Administrator may disqualify the durability-data vehicle or engine.

(4) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the vehicle/engine unrepresentative of vehicles in-use, the vehicle/engine shall not be used for determining deterioration factors.

(5) Repairs to vehicle components of a durability data vehicle other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(e) *Maintenance on emission data vehicles and engines.* (1) Adjustment of engine idle speed on emission data vehicles may be performed once before the low-mileage/low-hour emission test point. Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on emission data vehicles shall be performed only with the advance approval of the Administrator.

(2) Maintenance on light-duty truck emission-data vehicles selected under § 86.090–24(b)(1) (v) or (vii), and permitted to be tested for purposes of § 86.090–23(c)(1)(ii) under the provisions of § 86.090–24(b)(2), may be per-

formed in conjunction with emission control system modifications at the low-mileage test point, and shall be performed in accordance with the maintenance instructions to be provided to the ultimate purchaser required under § 86.087-38.

(3) Maintenance on those light-duty truck emission-data vehicles selected under 86.090-24(b)(1)(v) which are not capable of being modified in the field for the purpose of complying with emissions standards at an altitude other than that intended by the original design, may be performed in conjunction with the emission control system modifications at the low-mileage test point, and shall be approved in advance by the Administrator.

(4) Repairs to vehicle components of an emission data vehicle other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(f) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets and:

(1) Are used in conjunction with scheduled maintenance on such components, or

(2) Are used subsequent to the identification of a vehicle or engine malfunction, as provided in paragraph (d)(2) of this section for durability data vehicles or in paragraph (e)(1) of this section for emission-data vehicles, or

(3) Unless specifically authorized by the Administrator.

(g)(1) Paragraph (g) of this section applies to light-duty vehicles.

(2) Complete emission tests (see §§ 86.106 through 86.145) are required, unless waived by the Administrator, before and after scheduled maintenance approved for durability data vehicles. The manufacturer may perform emission tests before unscheduled maintenance. Complete emission tests are required after unscheduled maintenance which may reasonably be expected to affect emissions. The Administrator may waive the requirement to test after unscheduled maintenance. These test data may be submitted weekly to the Administrator, but shall be air posted or delivered within 7 days after completion of the tests, along with a complete record of all pertinent maintenance, including a preliminary engineering report of any malfunction diagnosis and the corrective action taken. A complete engineering report shall be delivered to the Administrator concurrently with the manufacturer's application for certification.

(h) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Administrator in accordance with § 86.090-23.

[53 FR 471, Jan. 7, 1988, as amended at 54 FR 14478, Apr. 11, 1989]

§ 86.090-26 Mileage and service accumulation; emission requirements.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles.

(2) The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV to this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 86.129, the manufacturer may elect to conduct the respective emission tests at higher loaded vehicle weight.

(3) *Emission-data vehicles.* Unless otherwise provided for in § 86.090-23(a), emission-data vehicles shall be operated and tested as follows:

(i) *Otto-cycle.* (A) The manufacturer shall determine, for engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. Any vehicle used to represent emission-data vehicle selections under § 86.090-24(b)(1) shall be equipped with an engine and emission control system that has accumulated at least the mileage determined under this paragraph. Fuel economy data generated from certification vehicles selected in accordance with § 86.090-24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006-82(c). Complete exhaust and evaporative (if required) emission tests shall be conducted for each emission-data vehicle selection under § 86.090-24(b)(1). The Administrator may determine under § 86.090-24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.090-24(b)(1) (v) or (viii) shall be conducted at the mileage at which the engine system combination is stabilized for emission testing under high-altitude conditions.

(C) Exhaust and evaporative emissions tests for emission-data vehicle(s) selected for testing under § 86.090-24(b)(1) (i), (ii), (iii), (iv), or (vii)(B) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing under low-altitude conditions.

(D) For each engine family, the manufacturer will either select one vehicle previously selected under § 86.090-24(b)(1) (i) through (iv) to be tested under high-altitude conditions or provide a statement in accordance with § 86.090-24(b)(1)(v). Vehicles shall meet emission standards under both low- and high-altitude conditions without manual adjustments or modifications. In addition, any emission control device used to conform with the emission standards under high-altitude conditions shall initially actuate (automatically) no higher than 4,000 feet above sea level.

(ii) *Diesel.* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. Any vehicle used to represent emission-data vehicle selections under § 86.090-24(b)(1) shall be equipped with an engine and emission control system that has accumulated at least the mileage determined under this paragraph. Fuel economy data generated from certification vehicles selected in accordance with § 86.090-24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006-82(c). Complete exhaust emission tests shall be conducted for each emission-data vehicle selection under § 86.090-24(b)(1). The Administrator may determine under § 86.090-24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.090-24(b)(1)(v) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing under low-altitude conditions.

(C) Exhaust and evaporative emission tests for emission-data vehicle(s) selected for testing under § 86.090-24(b)(1) (i) through (iv) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing under low-altitude conditions.

(D) For each engine family, the manufacturer will either select one vehicle previously selected under § 86.090-24(b)(1) (i) through (iv) to be tested under high-altitude conditions or provide a statement in accordance with § 86.090-24(b)(1)(v). Vehicles shall meet emission standards under both low- and high-altitude conditions without manual adjustments or modifications. In addition, any emission control device used to conform with the emission standards under high-altitude conditions shall initially actuate (automatically) no higher than 4,000 feet above sea level.

(4)(i) *Durability data vehicles.* (A) Unless otherwise provided for in § 86.090-23(a), each durability-data vehicle shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objective of this procedure.

(B) Complete exhaust emission tests shall be made at test point mileage intervals that the manufacturer determines.

(C) At a minimum, two complete exhaust emission tests shall be made. The first test shall be made at a distance not greater than 6,250 miles. The last shall be made at 50,000 miles.

(D) The mileage interval between test points must be of equal length except for the interval between zero miles and the first test, and any interval before or after testing conducted in conjunction with vehicle maintenance as specified in § 86.090-25(g)(2).

(ii) The manufacturer may, at its option, alter the durability-data vehicle at the selected test point to represent emission-data vehicle(s) within the same engine/system combination and perform emission tests on the altered vehicle. Upon completion of emission testing, the manufacturer may return the test vehicle to the durability-data vehicle configuration prior to the continuation of mileage accumulation.

(5)(i) All tests required by this subpart on emission-data vehicles shall be conducted at a mileage equal to or greater than the mileage the manufacturer determines under paragraph (a)(3) of this section.

(ii) All tests required by this subpart on durability-data vehicles shall be conducted within 250 miles of each of the test points.

(6)(i)(A) The manufacturer may conduct multiple tests at any test point at which the data are intended to be used in the deterioration factor. At each test point where multiple tests are conducted, the test results from all valid tests shall be averaged to determine the data point to be used in the deterioration factor calculation, except under paragraph (a)(6)(i)(B) of this section. The test results from emission tests performed before maintenance affecting emissions shall not be averaged with test results after the maintenance.

(B) The manufacturer is not required to average multiple tests if the manufacturer conducts no more than three tests at each test point and if the number of tests at each test point is equal. All test points must be treated the same for all exhaust pollutants.

(ii) The results of all emission testing shall be supplied to the Administrator. The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) may be submitted weekly to the Administrator, but shall be air posted or delivered to the Administrator within 7 days after completion of the test. In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.090-23. Where the Administrator conducts a test on a durability-data vehicle at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(iii) The results of all emission tests shall be rounded, in accordance with ASTM E 29-67, to the number of decimal places contained in the applicable emission standard expressed to one additional significant figure.

(7) Whenever a manufacturer intends to operate and test a vehicle which may be used for emission or durability data, the manufacturer shall retain in its records all information concerning all emissions tests and maintenance, including vehicle alterations to represent other vehicle selections. For emission-data vehicles, this information shall be submitted, including the vehicle description and specification information required by the Administrator, to the Administrator following the emission-data test. For durability-data vehicles, this information shall be submitted following the 5,000-mile test.

(8) Once a manufacturer submits the information required in paragraphs (a)(7) of this section for a durability-data vehicle, the manufacturer shall continue to run the vehicle to 50,000

miles, and the data from the vehicle will be used in the calculations under § 86.090-28. Discontinuation of a durability-data vehicle shall be allowed only with the consent of the Administrator.

(9)(i) The Administrator may elect to operate and test any test vehicle during all or any part of the mileage accumulation and testing procedure. In such cases, the manufacturer shall provide the vehicle(s) to the Administrator with all information necessary to conduct this testing.

(ii) The test procedures in §§ 86.106 through 86.145 will be followed by the Administrator. The Administrator will test the vehicles at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other vehicles of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(10) Emission testing of any type with respect to any certification vehicle other than that specified in this part is not allowed except as such testing may be specifically authorized by the Administrator.

(11) This section does not apply to testing conducted to meet the requirements of § 86.090-23(b)(2).

(b)(1) Paragraph (b) of this section applies to light-duty trucks.

(2) There are three types of mileage or service accumulation applicable to light-duty trucks:

(i) Mileage or service accumulation on vehicles, engines, subsystems, or components selected by the manufacturer under § 86.090-24(c)(2)(i). The manufacturer determines the form and extent of this mileage or service accumulation, consistent with good engineering practice, and describes it in the application for certification.

(ii) Mileage accumulation of the duration selected by the manufacturer on emission-data vehicles selected under § 86.090-24(b)(1). The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV to this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 86.129, the manufacturer may elect to conduct the respective emission tests at the test weight corresponding to the higher loaded vehicle weight.

(iii) Service or mileage accumulation which may be part of the test procedures used by the manufacturer to establish evaporative emission deterioration factors.

(3) Exhaust emission deterioration factors will be determined on the basis of the mileage or service accumulation described in paragraph (b)(2)(i) of this section and related testing, according to the manufacturer's procedures.

(4) Each emission-data vehicle shall be operated and tested as follows:

(i) *Otto-cycle.* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. Any vehicle used to represent emission-data vehicle selections under § 86.090-24(b)(1) shall be equipped with an engine and emission control system that has accumulated at least the mileage determined under this paragraph. Fuel economy data generated from certification vehicles selected in accordance with § 86.090-24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006-82(c). Complete exhaust emission tests shall be conducted for each emission-data vehicle selection under § 86.090–24(b)(1). The Administrator may determine under § 86.090-24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.090-24(b)(1) (v) or (viii) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing or at 6,436 kilometers (4,000-miles) under high-altitude conditions.

(C) Exhaust and evaporative emission tests for emission-data vehicle(s) selected for testing under § 86.090-24(b)(1) (ii), (iii), (iv)(A), or (vii)(B) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing or at the 6,436-kilometer (4,000-mile) test point under low-altitude conditions.

(D) If the manufacturer recommends adjustments or modifications in order to conform to emission standards at high altitude, such adjustments or modifications shall be made to the test vehicle selected under § 86.090–24(b)(1) (v) and (viii) (in accordance with the instructions to be provided to the ultimate purchaser) before being tested under high-altitude conditions.

(ii) *Diesel.* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. Any vehicle used to represent emission-data vehicle selections under § 86.090–24(b)(1) shall be equipped with an engine and emission control system that has accumulated at least the mileage determined under this paragraph. Fuel economy data generated from certification vehicles selected in accordance with § 86.090–24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006–82(c). Complete exhaust emission tests shall be conducted for each emission-data vehicle selection under § 86.090–24(b)(1). The Administrator may determine under § 86.090-24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.090-24(b)(1)(v) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing or at the 6,436-kilometer (4,000-mile) test point under low-altitude conditions.

(C) Exhaust and evaporative emission tests for emission-data vehicle(s) selected for testing under § 86.090-24(b)(1) (ii), (iii), and (iv) shall be conducted at the mileage at which the engine-system combination is stabilized for emission testing or at the 6,436-kilometer (4,000-mile) test point under low-altitude conditions.

(D) If the manufacturer recommends adjustments or modifications in order to conform to emission standards at high altitude, such adjustments or modifications shall be made to the test vehicle selected under § 86.090-24(b)(1) (v) and (viii) (in accordance with the instructions to be provided to the ultimate purchaser) before being tested under high-altitude conditions.

(iii) [Reserved]

(iv) All tests required by this subpart on emission-data vehicles shall be conducted at a mileage equal to or greater than the mileage the manufacturer determines under paragraph (b)(4) of this section.

(c)(1) Paragraph (c) of this section applies to heavy-duty engines.

(2) There are two types of service accumulation applicable to heavy-duty engines:

(i) Service accumulation on engines, subsystems, or components selected by the manufacturer under § 86.088-24(c)(3)(i). The manufacturer determines the form and extent of this service accumulation, consistent with good engineering practice, and describes it in the application for certification.

(ii) Dynamometer service accumulation on emission-data engines selected under § 86.090–24(b) (2) or (3). The manufacturer determines the engine operating schedule to be used for dynamometer service accumulation, consistent with good engineering practice. A single engine operating schedule shall be used for all engines in an engine family-control system combination. Operating schedules may be different for different combinations.

(3) Exhaust emission deterioration factors will be determined on the basis of the service accumulation described in paragraph (b)(2)(i) of this section and related testing, according to the manufacturer's procedures.

(4) The manufacturer shall determine, for each engine family, the number of hours at which the engine system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested a record of the rationale used in making this determination. The manufacturer may elect to accumulate 125 hours on each test engine within an engine family without making a determination. Any engine used to represent emission-data engine selections under § 86.090-24(b)(2) shall be equipped with an engine system combination that has accumulated at least the number of hours determined under this paragraph. Complete exhaust emission tests shall be conducted for each emission-data engine selection under § 86.090-24(b)(2). Evaporative emission controls need not be connected provided normal operating conditions are maintained in the engine induction system. The Administrator may determine under § 86.090-24(f) that no testing is required.

(d)(1) Paragraph (d) of this section applies to both light-duty trucks and heavy-duty engines.

(2)(i) The results of all emission testing shall be supplied to the Administrator. The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) may be submitted weekly to the Administrator, but shall be air posted or delivered to the Administrator within 7 days after completion of the tests. In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.090-23. Where the Administrator conducts a test on a durability-data vehicle at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be recorded and reported to the Administrator. These test results shall be rounded, in accordance with ASTM E 29-67, to the number of decimal places contained in the applicable emission standard expressed to one additional significant figure.

(3) Whenever a manufacturer intends to operate and test a vehicle (or engine) which may be used for emission data, the manufacturer shall retain in its records all information concerning all emissions tests and maintenance, including vehicle (or engine) alterations to represent other vehicle (or engine) selections. This information shall be submitted, including the vehicle (or engine) description and specification information required by the Administrator, to the Administrator following the emission-data test.

(4)—(5) [Reserved]

(6) Emission testing of any type with respect to any certification vehicle or engine other than that specified in this subpart is not allowed except as such testing may be specifically authorized by the Administrator.

[54 FR 14478, Apr. 11, 1989]

§ 86.090-27 Special test procedures.

(a) The Administrator may, on the basis of written application by a manufacturer, prescribe test procedures other than those set forth in this part for any light-duty vehicle, light-duty truck, heavy-duty engine, or heavy-duty vehicle which the Administrator determines is not susceptible to satisfactory testing by the procedures set forth in this part.

(b) If the manufacturer does not submit a written application for use of special test procedures but the Administrator determines that a light-duty vehicle, light-duty truck, heavy-duty engine, or heavy-duty vehicle is not susceptible to satisfactory testing by the procedures set forth in this part, the Administrator shall notify the manufacturer in writing and set forth the reasons for such rejection in accordance with the provisions of § 86.090–22(c).

[54 FR 14481, Apr. 11, 1989]

§ 86.090–28 Compliance with emission standards.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles.

(2) The applicable exhaust and evaporative emission standards (and family particulate emission limits, as appropriate) of this subpart apply to the emissions of vehicles for their useful life.

(3) Since it is expected that emission control efficiency will change with mileage accumulation on the vehicle, the emission level of a vehicle which has accumulated 50,000 miles will be used as the basis for determining compliance with the standards (or family particulate emission limit, as appropriate).

(4) The procedure for determining compliance of a new motor vehicle with exhaust emission standards (or family particulate emission limit, as appropriate) is as follows, except where specified by paragraph (a)(7) of this section for the Alternative Durability Program:

(i) Separate emission deterioration factors shall be determined from the exhaust emission results of the durability data vehicle(s) for each engine-system combination. A separate factor shall be established for exhaust HC, exhaust OMHCE (methanol-fueled vehicles) exhaust CO, exhaust NO_x, and exhaust particulate (diesel vehicles) for each engine-system combination. A separate evaporative emission deterioration factor shall be determined for each evaporative emission family-evaporative emission control system combination from the testing conducted by the manufacturer (gasoline-fueled and methanol-fueled vehicles only).

(A) The applicable results to be used unless excluded by paragraph (a)(4)(i)(A)(*4*) of this section in determining the exhaust emission deterioration factors for each engine-system combination shall be:

(*1*) All valid exhaust emission data from the tests required under § 86.088–26(a)(4) except the zero-mile tests. This shall include the official test results, as determined in § 86.090–29 for all tests conducted on all durability-data vehicles of the combination selected under § 86.090–24(c) (including all vehicles elected to be operated by the manufacturer under § 86.090–24(c)(1)(ii)).

(*2*) All exhaust emission data from the tests conducted before and after the scheduled maintenance provided in § 86.088–25.

(*3*) All exhaust emission data from tests required by maintenance approved under § 86.088–25, in those cases where the Administrator conditioned his approval for the performance of such maintenance on the inclusion of such data in the deterioration factor calculation.

(*4*) The manufacturer has the option of applying an outlier test point procedure to completed durability data within its certification testing program for a given model year. The outlier procedure will be specified by the Administrator. For any pollutant, durability-data test points that are identified as outliers shall not be included in the determination of deterioration factors if the manufacturer has elected this option. The manufacturer shall specify to the Administrator before the certification of the first engine family for that model year, if it intends to use the outlier procedure. The manufacturer may not change procedures after the first engine family of the model year is certified. Where the manufacturer chooses to apply both the outlier procedure and averaging (as allowed under § 86.088–26(a)(6)(i) to the same data set, the outlier procedure shall be completed prior to applying the averaging procedure.

(B) All applicable exhaust emission results shall be plotted as a function of the mileage on the system, rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The data will be acceptable for use in the calculation of the deterioration factor only if the interpolated 4,000-mile and 50,000-mile points on this line are within the low-altitude standards provided in § 86.090–8. Exceptions to this where data are still acceptable are when a best fit straight line crosses an applicable standard but no data points exceeded the standard, or the best fit straight line crosses an applicable standard with a negative slope (the 4,000-mile interpolated point is higher than the 50,000-mile interpolated point) but the 50,000-mile actual data point is below the standard. A multiplicative exhaust emission deterioration factor shall be calculated for each engine-system combination as follows:

Factor = Exhaust emissions interpolated to 50,000 miles divided by exhaust emissions interpolated to 4,000 miles.

These interpolated values shall be carried out to a minimum of four places to the right of the decimal point before dividing one by the other to determine the deterioration factor. The results shall be rounded to three places to the right of the decimal point in accordance with ASTM E 29-67.

(C) An evaporative emissions deterioration factor (gasoline-fueled and methanol-fueled vehicles only) shall be determined from the testing conducted as described in § 86.090–21(b)(4)(i), for each evaporative emission family-evaporative emission control system combination to indicate the evaporative emission level at 50,000 miles relative to the evaporative emission level at 4,000 miles as follows:

Factor = Evaporative emission level at 50,000 miles minus the evaporative emission level at 4,000 miles.

The factor shall be established to a minimum of two places to the right of the decimal.

(ii)(A) The official exhaust emission test results for each emission-data vehicle at the selected test point shall be multiplied by the appropriate deterioration factor: *Provided*, that if a deterioration factor as computed in paragraph (a)(4)(i)(B) of this section is less than one, that deterioration factor shall be one for the purposes of this paragraph.

(B) The official evaporative emission test results (gasoline-fueled and methanol-fueled vehicles only) for each evaporative emission-data vehicle at the selected test point shall be adjusted by addition of the appropriate deterioration factor: *Provided*, that if a deterioration factor as computed in paragraph (a)(4)(i)(C) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(iii) The emissions to compare with the standard (or the family particulate emission limit, as appropriate) shall be the adjusted emissions of paragraphs (a)(4)(ii) (A) and (B) of this section for each emission-data vehicle. Before any emission value is compared with the standard (or the family particulate emission limit, as appropriate), it shall be rounded, in accordance with ASTM E 29-67, to two significant figures. The rounded emission values may not exceed the standard (or the family particulate emission limit, as appropriate).

(iv) Every test vehicle of an engine family must comply with the exhaust emission standards (or the family particulate emission limit, as appropriate), as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(v) Every test vehicle of an evaporative emission family must comply with the evaporative emission standard, as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(5) If a manufacturer chooses to change the level of any family particulate emission limit(s) in the particulate averaging program, compliance with the new limit(s) must be based upon existing certification data.

(6) If a manufacturer chooses to participate in the diesel particulate averaging program, the production-weighted average of the family particulate emission limits of all affected engine families must comply with the particulate standard in § 86.090–8(a)(1)(iv), or the composite particulate standard defined in § 86.088–2, as appropriate, at the end of the production year.

(7) The procedure to determine the compliance of new motor vehicles in the Alternative Durability Program

(described in § 86.085-13) is the same as described in paragraphs (a)(4)(iii) through (a)(4)(v) of this section. For the engine families that are included in the Alternative Durability Program, the exhaust emission deterioration factors used to determine compliance shall be those that the Administrator has approved under § 86.085-13(c). The evaporative emission deterioration factor for each evaporative emission family shall be determined and applied according to paragraph (a)(4) of this section. The procedures to determine the minimum exhaust emissions deterioration factors required under § 86.085-13(d) are as follows:

(i) Separate deterioration factors shall be determined from the exhaust emission results of the durability-data vehicles for each engine family group. A separate factor shall be established for exhaust HC, exhaust CO, and exhaust NO_x for each engine family group. The evaporative emission deterioration factor for each evaporative family will be determined and applied in accordance with paragraph (a)(4) of this section.

(ii) The deterioration factors for each engine family group shall be determined by the Administrator using historical durability data from as many as three previous model years. These data will consist of deterioration factors generated by durability-data vehicles representing certified engine families and of deterioration factors from vehicles selected under § 86.090-24(h). The Administrator shall determine how these data will be combined for each engine family group.

(A) The test results to be used in the calculation of each deterioration factor to be combined for each engine family group shall be those test results specified in paragraph (a)(4)(i)(A) of this section.

(B) For each durability-data vehicle selected under § 86.090-24(h), all applicable exhaust emissions results shall be plotted as a function of the mileage on the system rounded to the nearest mile, and the best fit straight lines, fitted by method of least squares, shall be drawn through all these data points. The exhaust deterioration factor for each durability-data vehicle shall be calculated as specified in paragraph (a)(4)(i)(B) of this section.

(C) *Line crossing.* For the purposes of paragraph (a)(5) of this section, line crossing occurs when either of the interpolated 4,000- and 50,000-mile points of the best fit straight line exceeds the applicable emission standard and at least one applicable data point exceeds the standard.

(*1*) The Administrator will not accept for certification line-crossing data from preproduction durability-data vehicles selected under § 86.090-24(c), § 86.090-24 (h)(2), or (h)(3).

(*2*) The Administrator will not accept for certification line-crossing data from production durability-data vehicles selected under § 86.090-24(h)(1) unless the 4,000-mile test result multiplied by the engine family group deterioration factor does not exceed the applicable emission standards. The deterioration factors used for this purpose shall be those that were used in the certification of the production vehicle. Manufacturers may calculate this product immediately after the 4,000-mile test of the vehicle. If the product exceeds the applicable standards, the manufacturer may, with the approval of the Administrator, discontinue the vehicle and substitute a new vehicle. The manufacturer may continue the original vehicle, but the data will not be acceptable if line crossing occurs.

(b)(1) Paragraph (b) of this section applies to light-duty trucks.

(2) The exhaust and evaporative emission standards (and family emission limits, as appropriate) of § 86.090-9 apply to the emissions of vehicles for their useful life.

(3) Since emission control efficiency generally decreases with the accumulation of mileage on the vehicle, deterioration factors will be used in combination with emission-data vehicle test results as the basis for determining compliance with the standards (or family emission limits, as appropriate).

(4)(i) Paragraph (b)(4) of this section describes the procedure for determining compliance of a new vehicle with exhaust emission standards (or family emission limits, as appropriate), based on deterioration factors supplied by the manufacturers, except where specified by paragraph (b)(5) of this section for the Alternative Durability Program.

(ii) Separate exhaust emission deterioration factors, determined from tests of vehicles, engines, subsystems, or components conducted by the manufacturer, shall be supplied for each engine-system combination. Separate factors shall be established for transient HC, CO, and NO_x, idle CO (vehicles equipped with Otto-cycle or methanol-fueled diesel engines only), and exhaust particulate (diesel vehicles only).

(iii) For transient HC, OMHCE (methanol-fueled vehicles), CO, and NO_x, idle CO (vehicles equipped with Otto-cycle or methanol-fueled diesel engines only), and exhaust particulate (diesel vehicles), the official exhaust emission results for each emission-data vehicle at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(iv) The emission values to compare with the standards (or family emission limits, as appropriate) shall be the adjusted emission values of paragraph (b)(4)(iii) of this section, rounded to the same number of significant figures as contained in the applicable standard in accordance with ASTM E 29–67, for each emission-data engine.

(5)(i) Paragraph (b)(5)(i) of this section applies only to manufacturers electing to participate in the particulate averaging program.

(A) If a manufacturer chooses to change the level of any family particulate emission limit(s), compliance with the new limit(s) must be based upon existing certification data.

(B) The production-weighted average of the family particulate emission limits of all applicable engine families, rounded to two significant figures in accordance with ASTM E 29–67, must comply with the particulate standards in § 86.090–9(a)(1)(iv) or (d)(1)(iv), or the composite particulate standard defined in § 86.085–2, as appropriate, at the end of the product year.

(ii) Paragraph (b)(5)(ii) of this section applies only to manufacturers electing to participate in the NO_x averaging program.

(A) If a manufacturer chooses to change the level of any family NO_x emission limit(s), compliance with the new limit(s) must be based upon existing certification data.

(B) The production-weighted average of the family NO_x emission limits of all applicable engine families, rounded to two significant figures in accordance with ASTM E 29–67, must comply with the NO_x emission standards of § 86.090–9(a)(1)(iii) (A) or (B), or of § 86.090–9(d)(1)(iii) (A) or (B), or the composite NO_x standard as defined in § 86.088–2, at the end of the product year.

(6) The procedure to determine the compliance of new motor vehicles in the Alternative Durability Program (described in § 86.085–13) is the same as described in paragraphs (b)(4)(iv), (b)(7)(iv) and (b)(8) of this section. For the engine families that are included in the Alternative Durability Program, the exhaust emission deterioration factors used to determine compliance shall be those that the Administrator has approved under § 86.085–13(c). The evaporative emission deterioration factor for each evaporative emission family shall be determined and applied according to paragraph (b)(7) of this section. The procedures to determine the minimum exhaust emissions deterioration factors required under § 86.085–13(d) are as follows:

(i) Separate deterioration factors shall be determined from the exhaust emission results of the durability-data vehicles for each engine family group. A separate factor shall be established for exhaust HC, exhaust CO, and exhaust NO_x for each engine family group. The evaporative emission deterioration factor for each evaporative family will be determined and applied in accordance with paragraph (b)(6) of this section.

(ii) The deterioration factors for each engine family group shall be determined by the Administrator using historical durability data from as many as three previous model years. These data will consist of deterioration factors generated by durability-data vehicles representing certified engine families and of deterioration factors from vehicles selected under § 86.090-24(h). The Administrator shall determine how these data will be combined for each engine family group.

(A) The test results to be used in the calculations of each deterioration factor to be combined for each engine family group shall be those test results specified in paragraph (a)(4)(i)(A) of this section.

(B) For each durability-data vehicle selected under § 86.090-24(h), all applicable exhaust emission results shall be plotted as a function of the mileage on the system rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The exhaust deterioration factor for each durability-data vehicle shall be calculated as specified in paragraph (a)(4)(i)(B) of this section.

(C) *Line crossing.* For the purposes of paragraph (b)(5) of this section, line crossing occurs when either of the interpolated 4,000- and 120,000-mile points of the best fit straight line exceeds the applicable emission standard and at least one applicable data point exceeds the standard.

(*1*) The Administrator will not accept for certification line-crossing data from preproduction durability-data vehicles selected under § 86.090-24(c)(1), or § 86.090-24 (h)(2) or (h)(3).

(*2*) The Administrator will not accept for certification line-crossing data from production durability-data vehicles selected under § 86.090-24(h)(1) unless the 4,000-mile test result multiplied by the engine family group deterioration factor does not exceed the applicable emission standard. The deterioration factors used for this purpose shall be those that were used in the certification of the production vehicle. Manufacturers may calculate this product immediately after the 4,000-mile test of the vehicle. If the product exceeds the applicable standard, the manufacturer may, with the approval of the Administrator, discontinue the vehicle and substitute a new vehicle. The manufacturer may continue the original vehicle, but the data will not be acceptable if line crossing occurs.

(7)(i) Paragraph (b)(7) of this section describes the procedure for determining compliance of a new vehicle with fuel evaporative emission standards. The procedure described here shall be used for all vehicles in all model years.

(ii) The manufacturer shall determine, based on testing described in § 86.090-21(b)(4)(i), and supply an evaporative emission deterioration factor for each evaporative emission family-evaporative emission control system combination. The factor shall be calculated by subtracting the emission level at the selected test point from the emission level at the useful life point.

(iii) The official evaporative emission test results for each evaporative emission-data vehicle at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission value to compare with the standards shall be the adjusted emission value of paragraph (b)(7)(iii) of this section rounded to two significant figures in accordance with ASTM E 29-67 for each evaporative emission-data vehicle.

(8) Every test vehicle of an engine family must comply with all applicable standards (and family emission limits, as appropriate), as determined in paragraphs (b)(4)(iv) and (b)(7)(iv) of this section, before any vehicle in that family will be certified.

(c)(1) Paragraph (c) of this section applies to heavy-duty engines.

(2) The exhaust emission standards for Otto cycle engines in § 86.090-10 or for diesel engines in § 86.090-11 apply to the emissions of engines for their useful life.

(3) Since emission control efficiency generally decreases with the accumulation of service on the engine, deterioration factors will be used in combination with emission-data engine test results as the basis for determining compliance with the standards.

(4)(i) Paragraph (c)(4) of this section describes the procedure for determining compliance of an engine with emission standards (or family emission limits, as appropriate), based on deterioration factors supplied by the manufacturer.

(ii) Separate exhaust emission deterioration factors, determined from tests of engines, subsystems, or components conducted by the manufacturer, shall be supplied for each engine-system combination. For Otto-cycle engines, separate factors shall be established for transient HC (OMHCE for methanol-fueled vehicles), CO, and NO_x; and idle CO, for those engines utilizing aftertreatment technology (*e.g.,* catalytic converters). For diesel engines, separate factors shall be established for transient HC (OMHCE for methanol-fueled engines), CO, NO_x, and exhaust particulate. For diesel smoke testing, separate factors shall also be established for the acceleration mode (designated as "A"), the lugging mode (designated as "B"), and peak opacity (designated as "C").

(iii)(A) Paragraph (c)(4)(iii)(A) of this section applies to Otto-cycle heavy-duty engines.

(*1*) *Otto-cycle heavy-duty engines not utilizing aftertreatment technology (e.g., catalytic converters).* For transient HC (OMHCE), CO, and NO_x, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(*2*) *Otto-cycle heavy-duty engines utilizing aftertreatment technology (e.g., catalytic converters).* For transient HC (OMHCE), CO, and NO_x, and for idle CO, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(B) Paragraph (c)(4)(iii)(B) of this section applies to diesel heavy-duty engines.

(*1*) *Diesel heavy-duty engines not utilizing aftertreatment technology (e.g., particulate traps).* For transient HC (OMHCE), CO, NO_x, and exhaust particulate, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(*2*) *Diesel heavy-duty engines utilizing aftertreatment technology (e.g., particulate traps).* For transient HC (OMHCE), CO, NO_x, and exhaust particulate, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(*3*) Diesel heavy duty engines only. For acceleration smoke ("A"), lugging smoke ("B"), and peak smoke ("C"), the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission values to compare with the standards (or family emission limits, as appropriate) shall be the adjusted emission values of paragraph (c)(4)(iii) of this section, rounded to the same number of significant figures as contained in the applicable standard in accordance with ASTM E 29 67, for each emission data engine.

(5)—(6) [Reserved]

(7) Every test engine of an engine family must comply with all applicable standards (or family emission limits, as appropriate), as determined in paragraph (c)(4)(iv) of this section, before any engine in that family will be certified.

(d)(1) Paragraph (d) of this section applies to heavy-duty vehicles equipped with gasoline-fueled or methanol-fueled engines.

(2) The applicable evaporative emission standard in § 86.090-10 or

§ 86.090-11 applies to the emissions of vehicles for their useful life.

(3)(i) For vehicles with a GVWR of up to 26,000 pounds, because it is expected that emission control efficiency will change during the useful life of the vehicle, an evaporative emission deterioration factor shall be determined from the testing described in § 86.090-23(b)(3) for each evaporative emission family-evaporative emission control system combination to indicate the evaporative emission control system deterioration during the useful life of the vehicle (minimum 50,000 miles). The factor shall be established to a minimum of two places to the right of the decimal.

(ii) For vehicles with a GVWR of greater than 26,000 pounds, because it is expected that emission control efficiency will change during the useful life of the vehicle, each manufacturer's statement as required in § 86.090-23(b)(4)(ii) shall include, in accordance with good engineering practice, consideration of control system deterioration.

(4) The evaporative emission test results, if any, shall be adjusted by the addition of the appropriate deterioration factor: *Provided*, that if the deterioration factor as computed in paragraph (d)(3) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(5) The emission level to compare with the standard shall be the adjusted emission level of paragraph (d)(4) of this section. Before any emission value is compared with the standard, it shall be rounded, in accordance with ASTM E 29-67, to two significant figures. The rounded emission values may not exceed the standard.

(6) Every test vehicle of an evaporative emission family must comply with the evaporative emission standard, as determined in paragraph (d)(5) of this section, before any vehicle in that family may be certified.

[54 FR 14481, Apr. 11, 1989]

§ 86.090-29 Testing by the Administrator.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(2) The Administrator may require that any one or more of the test vehicles be submitted to him, at such place or places as he may designate, for the purposes of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test vehicle, the results of that test shall, unless subsequently invalidated by the Administrator, comprise the official data for the vehicle at the prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards (or family emission limits, as appropriate).

(ii) Whenever the Administrator does not conduct a test on a test vehicle at a test point, the manufacturer's test data will be accepted as the official data for that point: *Provided*, that if the Administrator makes a determination based on testing under paragraph (a)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, and *further provided*, that if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provisions of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission of further information. If the manufacturer conducts more than one test on a vehicle, as authorized under § 86.088-26 (a)(3)(i)(A) or (b)(4)(i)(A), the data from the last test in that series of tests on that vehicle will constitute the official data.

(iii)(A)(*1*) The Administrator may adjust or cause to be adjusted any adjustable parameter of an emission data vehicle or engine which the Administrator has determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.090-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.090-22(e)(3)(i) prior to the performance of any tests to determine whether such vehicle or engine conforms to applicable emission standards, including tests performed by the manufacturer under § 86.090-23(c)(1). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before it accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. The Administrator, in making or specifying such adjustments, will consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use light-duty vehicles or light-duty trucks. In determining likelihood, the Administrator will consider factors such as, but not limited to, the effect of the adjustment on vehicle performance characteristics and surveillance information from similar in-use vehicles.

(*2*) For those vehicles or engine parameters which the Administrator has not determined to be subject to adjustment during certification and Selective Enforcement Audit testing in accordance with § 86.090-22(e)(1), the emission-data vehicle presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the vehicle label (see § 86.090-35 (a)(1)(iii)(D) or (a)(2)(iii)(D)) as specified in the application for certification. If the Administrator determines that a vehicle is not within such tolerances, the vehicle will be adjusted, at the facility designated by the Administrator, prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the vehicle will be used as an emission-data vehicle.

(B) If the Administrator determines that the test data developed on an emission-data vehicle under paragraph (a)(3)(i) of this section would cause that vehicle to fail due to excessive 4,000-mile emissions or by application of the appropriate deterioration factor, then the following procedure shall be observed:

(*1*) The manufacturer may request a retest. Before the retest, those vehicle or engine parameters which the Administrator has not determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.090-22(e)(1) may be readjusted to manufacturer's specification, if these adjustments were made incorrectly prior to the first test. The Administrator may adjust or cause to be adjusted any parameter which the Administrator has determined to be subject to adjustment to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.090-22(e)(3)(i). Other maintenance or repairs may be performed in accordance with § 86.088-25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The vehicle will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data vehicle.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (a)(2) of this section to enable the Administrator to determine whether an emission-data vehicle would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (a)(3)(iii) (A) and (B) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the vehicle from the test premises.

(b)(1) Paragraph (b) of this section applies to heavy-duty engines.

(2) The Administrator may require that any one or more of the test engines be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturers facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test engine the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the engine at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards (or family emission limits, as appropriate).

(ii) Whenever the Administrator does not conduct a test on a test engine at a test point, the manufacturer's test data will be accepted as the official data for that test point: *Provided,* that if the Administrator makes a determination based on testing under paragraph (b)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *and further provided,* that if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission of further information.

(iii)(A)(*1*) The Administrator may adjust or cause to be adjusted any adjustable parameter of an emission-data engine which the Administrator has determined to be subject to adjustment for certification testing in accordance with § 86.090-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.090-22(e)(3)(i), prior to the performance of any tests to determine whether such engine conforms to applicable emission standards, including tests performed by the manufacturer under § 86.090-23(c)(2). The Administrator, in making or specifying such adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use heavy-duty engines. In determining likelihood, the Administrator may consider factors such as, but not limited to, the effect of the adjustment on engine performance characteristics and surveillance information from similar in-use engines.

(*2*) For those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.090-22(e)(1), the emission-data engine presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer specifications to be shown on the engine label (see § 86.090-35(a)(3)(iii)) as specified in the application for certification. If the Administrator determines that an engine is not within such tolerances, the engine shall be adjusted at the facility designated by the Administrator prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the engine shall be used as an emission-data engine.

(B) If the Administrator determines that the test data developed under paragraph (b)(3)(iii)(A) of this section would cause the emission-data engine to fail due to excessive 125-hour emission values or by the application of the appropriate deterioration factor, then the following procedure shall be observed:

(*1*) The manufacturer may request a retest. Before the retest, those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.090–22(e)(1) may be readjusted to the manufacturer's specifications, if these adjustments were made incorrectly prior to the first test. The Administrator may adjust or cause to be adjusted any parameter which the Administrator has determined to be subject to adjustment in accordance with § 86.090–22(e)(3)(i). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before if accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. Other maintenance or repairs may be performed in accordance with § 86.088–25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The engine will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data engine.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (b)(2) of this section to enable the Administrator to determine whether an emission-data engine would fail, the manufacturer may request a retest in accordance with the provisions of paragraph (b)(3)(iii)(B) (*1*) and (*2*) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the engine from the test premises.

(c)(1) Paragraph (c) of this section applies to gasoline-fueled and methanol-fueled heavy-duty vehicles.

(2) The Administrator may require that any one or more of the evaporative emission family-system combinations included in the manufacturer's statement(s) of compliance be installed on an appropriate vehicle and such vehicle be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on an evaporative emission family-system combination the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the evaporative emission family-system combination and the manufacturer's data, analyses, etc., shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on an evaporative emission family-system combination, the manufacturer's test data will be accepted as the official data: *Provided,* that if the Administrator makes a determination, based on testing under paragraph (c)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *and further provided,* that if the Administrator has reasonable basis to believe that any test data, analyses, or other information submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept those data, analyses, etc., as the official data pending retesting or submission of further information.

[54 FR 14486, Apr. 11, 1989]

§ 86.090–30 Certification.

(a)(1)(i) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 86.078–7(c), and any other pertinent data or information, the Administrator determines that a test vehicle(s) (or test engine(s)) meet(s) the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such vehicle(s) (or engine(s)) except in cases covered by paragraphs (a)(1)(ii) and (c) of this section.

(ii) Gasoline-fueled and methanol-fueled heavy-duty vehicles. If, after a review of the statement(s) of compliance submitted by the manufacturer under § 86.090–23(b)(4) and any other pertinent data or information, the Administrator determines that the requirements of the Act and this subpart have been met, he will issue one certificate of conformity per manufacturer with respect to the evaporative emission family(s) covered by such statement(s) except in cases covered by paragraph (c) of this section.

(2) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary or appropriate to assure that any new motor vehicle (or new motor vehicle engine) covered by the certificate will meet the requirements of the Act and of this part.

(3)(i) One such certificate will be issued for each engine family. For gasoline-fueled and methanol-fueled light-duty vehicles and light-duty trucks, one such certificate will be issued for each engine family evaporative emission family combination.

(A) *Light-duty vehicles.* Each certificate will certify compliance with no more than one set of standards (or family emission limits, as appropriate).

(B) *Light-duty trucks.* Each certificate will certify compliance with no more than one set of standards (or family emission limits, as appropriate), except for low-altitude standards and high-altitude standards. The certificate shall state that it covers vehicles sold or delivered to an ultimate purchaser for principal use at a designated high-altitude location only if the vehicle conforms in all material respects to the design specifications that apply to those vehicles described in the application for certification at high altitude.

(ii) For gasoline-fueled and methanol- fueled heavy-duty vehicles, one such certificate will be issued for each manufacturer and will certify compliance for those vehicles previously identified in that manufacturer's statement(s) of compliance as required in § 86.090–23(b)(4) (i) and (ii).

(iii) For diesel light-duty vehicles and light-duty trucks included in the particulate averaging program, the manufacturer may at any time during production elect to change the level of any family particulate emission limit by demonstrating compliance with the new limit as described in §§ 86.090–28(a)(6) and 86.090–28(b)(5)(i). New certificates issued under this paragraph will be applicable only for vehicles produced subsequent to the date of issuance.

(iv) For light-duty trucks included in the NO_x averaging program, the manufacturer may at any time during production elect to change the level of any family NO_x emission limit by demonstrating compliance with the new limit as described in § 86.090–28(b)(5)(ii). New certificates issued under this paragraph will be applicable only for vehicles produced subsequent to the day of issue.

(4)(i) The adjustment or modification of any light-duty truck in accordance with instructions provided by the manufacturer for the altitude where the vehicle is principally used will not be considered a violation of section 203(a)(3) of the Clean Air Act.

(ii) A violation of section 203(a)(1) of the Clean Air Act occurs when a manufacturer sells or delivers to an ultimate purchaser any light-duty vehicle or light-duty truck, subject to the regulations under the Act, under any of the conditions specified in the remainder of this paragraph.

(A) When a light-duty vehicle or light-duty truck is not configured to meet high-altitude requirements:

(*1*) At a designated high-altitude location, unless such manufacturer has reason to believe that such vehicle will not be sold to an ultimate purchaser for principal use at a designated high-altitude location; or

(*2*) At a location other than a designated high-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated high-altitude location.

(B) When a light-duty vehicle is not configured to meet low-altitude requirements, as provided in § 86.087-8(i):

(*1*) At a designated low-altitude location, unless such manufacturer has reason to believe that such vehicle will not be sold to an ultimate purchaser for principal use at a designated low-altitude location; or

(*2*) At a location other than a designated low-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated low-altitude location.

(iii) A manufacturer shall be deemed to have reason to believe that a light-duty vehicle that has been exempted from compliance with emission standards at high altitude, or a light-duty truck which is not configured to meet high-altitude requirements, will not be sold to an ultimate purchaser for principal use at a designated high-altitude location if the manufacturer has informed its dealers and field representatives about the terms of these high-altitude regulations, has not caused the improper sale itself, and has taken reasonable action which shall include, but not be limited to, either paragraph (a)(4)(iii) (A) or (B), and (a)(4)(iii)(C) of this section:

(A) Requiring dealers in designated high-altitude locations to submit written statements to the manufacturer signed by the ultimate purchaser that a vehicle which is not configured to meet high-altitude requirements will not be used-principally at a designated high-altitude location; requiring dealers in counties contiguous to designated high-altitude locations to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location; and for each sale or delivery of fleets of ten or more such vehicles in a high-altitude location or in counties contiguous to high-altitude locations, requiring either the selling dealer or the delivering dealer to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location. In addition, the manufacturer will make available to EPA, upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold), sales, warranty, or other information pertaining to sales of vehicles by the dealers described above maintained by the manufacturer in the normal course of business relating to the altitude configuration of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of low-altitude vehicles by high-altitude dealers, or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser for principal use at a designated high-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a state or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser residing in a designated high-altitude location, or based on information obtained pursuant to paragraph (a)(4)(iii) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and, where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet high-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(iv) A manufacturer shall be deemed to have reason to believe that a light-duty vehicle which has been exempted from compliance with emission standards at low-altitude, as provided in § 86.090 8(i), will not be sold to an ultimate purchaser for principal use at a designated low-altitude location if the manufacturer has informed its dealers and field representatives about the terms of these high-altitude regulations, has not caused the improper sale itself, and has taken reasonable action which shall include, but not be limited to, either paragraph (a)(4)(iv)(A) or (B), and (a)(4)(iv)(C) of this section:

(A) Requiring dealers in designated low-altitude locations to submit written statements to the manufacturer signed by the ultimate purchaser that a vehicle which is not configured to met low-altitude requirements will not be used principally at a designated low-altitude location; requiring dealers in counties contiguous to designated low-altitude locations to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated low-altitude location, that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated low-altitude location; and for each sale or delivery of fleets of ten or more such vehicles in a low-altitude location or in counties contiguous to low-altitude locations, requiring either the selling dealer or the delivering dealer to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated low-altitude location, that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated low-altitude location. In addition, the manufacturer will make available to EPA, upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold), sales, warranty, or other information pertaining to sales of vehicles by the dealers described above maintained by the manufacturer in the normal course of business relating to the altitude configuration of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of high-altitude vehicles by low-altitude dealers, or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the low-altitude requirements to an ultimate purchaser for principal use at a designated low-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a state or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the low-altitude requirements to an ultimate purchaser residing in a designated low-altitude location, or based on information obtained pursuant to paragraph (a)(4)(iv) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet low-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(5)(i) For the purpose of paragraph (a) of this section, a "designated high-altitude location" is any county which has substantially all of its area located above 1,219 meters (4,000 feet) and:

(A) Requested an extension past the attainment date of December 31, 1982, for compliance with either the National Ambient Air Quality Standards for carbon monoxide or ozone, as indicated in Part 52 (Approval and Promulgation of Implementation Plans) of this title; or

(B) Is the same state as a county designated as a high-altitude location according to paragraph (a)(5)(i)(A) of this section.

(ii) The designated high-altitude locations defined in paragraph (a)(5)(i) of this section are listed below:

STATE OF COLORADO

Adams
Alamosa
Arapahoe
Archuleta
Boulder
Chaffee
Cheyenne
Clear Creek
Conejos
Costilla
Crowley
Custer
Delta
Denver
Dolores
Douglas
Eagle
Elbert
El Paso
Fremont
Garfield
Gilpin
Grand
Gunnison
Hinsdale
Huerfano
Jackson
Jefferson
Kit Carson
Lake
La Plata
Larimer
Las Animas
Lincoln
Mesa
Mineral
Moffat
Montezuma
Montrose
Morgan
Otero
Ouray
Park
Pitkin
Pueblo
Rio Blanco
Rio Grande
Routt
Saguache
San Juan
San Miguel
Summit
Teller
Washington
Weld

STATE OF NEVADA

Carson City
Douglas
Elko
Esmeralda
Eureka
Humboldt
Lander
Lincoln
Lyon
Mineral
Nye
Pershing
Storey
Washoe
White Pine

STATE OF NEW MEXICO

Bernalillo
Catron
Colfax
Curry
Sandoval
De Baca
Grant
Mora
Guadalupe
Harding
Hidalgo
Lincoln
Los Alamos
Luna
McKinley
Santa Fe
Otero
Rio Arriba
Roosevelt
Sandoval
San Juan
San Miguel
Sierra
Socorro
Taos
Torrance
Union
Valencia

STATE OF UTAH

Beaver
Box Elder
Cache
Carbon
Daggett
Davis
Duchesne
Emery
Garfield
Grand
Iron
Juab
Kane
Millard
Morgan
Piute
Rich
Salt Lake
San Juan
Sanpete
Sevier
Summit
Tooele
Uintah
Utah
Wasatch
Wayne
Weber

(iii) For the purpose of paragraph (a) of this section, a "designated low-altitude location" is any county which has substantially all of its area located below 1,219 meters (4,000 feet).

(iv) The designated low-altitude locations so defined include all counties in the United States which are not listed in either paragraph (a)(5)(ii) of this section or in the list below:

STATE OF ARIZONA

Apache
Cochise
Coconino
Navajo
Yavapai

STATE OF IDAHO

Bannock
Bear Lake
Bingham
Blaine
Bonneville
Butte
Camas
Caribou
Cassia
Clark
Custer
Franklin
Fremont
Jefferson
Lemhi
Madison
Minidoka
Oneida
Power
Teton
Valley

STATE OF MONTANA

Beaverhead
Deer Lodge
Gallatin
Jefferson

Judith Basin
Madison
Meagher
Park
Powell
Silver Bow
Wheatland

State of Nebraska

Banner
Cheyenne
Kimball
Sioux

State of Oregon

Harney
Klamath
Lake

State of Texas

Jeff Davis
Hudspeth
Parmer

State of Wyoming

Albany
Campbell
Carbon
Converse
Fremont
Goshen
Hot Springs
Johnson
Laramie
Lincoln
Natrona
Niobrara
Park
Platte
Sublette
Sweetwater
Teton
Uinta
Washakie
Weston

(6) Catalyst-equipped vehicles, otherwise covered by a certificate, which are driven outside the United States, Canada, and Mexico will be presumed to have been operated on leaded gasoline resulting in deactivation of the catalysts. If these vehicles are imported or offered for importation without retrofit of the catalyst, they will be considered not to be within the coverage of the certificate unless included in a catalyst control program operated by a manufacturer or a United States Government agency and approved by the Administrator.

(7) For incomplete light-duty trucks, a certificate covers only those new motor vehicles which, when completed by having the primary load-carrying device or container attached, conform to the maximum curb weight and frontal area limitations described in the application for certification as required in § 86.090-21(d).

(8) For heavy-duty engines, a certificate covers only those new motor vehicle engines installed in heavy-duty vehicles which conform to the minimum gross vehicle weight rating, curb weight, or frontal area limitations for heavy-duty vehicles described in § 86.082-2.

(9) For incomplete gasoline-fueled and methanol-fueled heavy-duty vehicles a certificate covers only those new motor vehicles which, when completed, conform to the nominal maximum fuel tank capacity limitations as described in the application for certification as required in § 86.090-21(e).

(10) For diesel light-duty vehicles and diesel light-duty truck families which are included in a particulate averaging program, the manufacturer's production-weighted average of the particulate emission limits of all engine families in a participating class or classes shall not exceed the applicable diesel particulate standard, or the composite particulate standard defined in § 86.090-2, as appropriate, at the end of the model year, as determined in accordance with 40 CFR Part 86. The certificate shall be void *ab initio* for those vehicles causing any exceedance of the particulate standard.

(11) For light-duty truck families which are included in the NO_x averaging program, the manufacturer's production weighted average of the NO_x emission limits of all such engine families shall not exceed the applicable light-duty truck NO_x standard, or the composite NO_x standard defined in § 86.088-2, as appropriate, at the end of the model year, as determined in accordance with 40 CFR Part 86. The certificate shall be void *ab initio* for those vehicles causing any exceedance of the NO_x standard.

(b)(1) The Administrator will determine whether a vehicle (or engine) covered by the application complies with applicable standards (or family emission limits, as appropriate) by observing the following relationships:

(i) *Light-duty vehicles.* (A) The durability-data vehicle(s) selected under § 86.090-24(c)(1)(i) shall represent all vehicles of the same engine-system combination.

(B) The emission-data vehicle(s) selected under § 86.090-24(b)(1) (ii) through (iv) shall represent all vehicles of the same engine-system combination as applicable.

(C) The emission-data vehicle(s) selected under § 86.090-24(b)(1)(vii) (A) and (B) shall represent all vehicles of the same evaporative control system within the evaporative family.

(ii) *Light-duty trucks.* (A) The emission-data vehicle(s) selected under § 86.090-24(b)(1)(ii), shall represent all vehicles of the same engine-system combination as applicable.

(B) The emission-data vehicle(s) selected under § 86.090-24(b)(1)(vii) (A) and (B) shall represent all vehicles of the same evaporative control system within the evaporative family.

(C) The emission-data vehicle(s) selected under § 86.090-24(b)(1)(v) shall represent all vehicles of the same engine-system combination as applicable.

(D) The emission-data vehicle(s) selected under § 86.090-24(b)(1)(viii) shall represent all vehicles of the same evaporative control system within the evaporative emission family, as applicable.

(iii) *Heavy duty engines.* (A) An Otto-cycle emission-data test engine selected under § 86.090-24(b)(2)(iv) shall represent all engines in the same family of the same engine displacement-exhaust emission control system combination.

(B) An Otto-cycle emission-data test engine selected under § 86.090-24(b)(2)(iii) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(C) A diesel emission-data test engine selected under § 86.090-24(b)(3)(ii) shall represent all engines in the same engine system combination.

(D) A diesel emission-data test engine selected under § 86.090-24(b)(3)(iii) shall represent all engines of that emission control system at the rated fuel delivery of the test engine.

(iv) *Gasoline-fueled and methanol-fueled heavy-duty vehicles.* A statement of compliance submitted under § 86.090-23(b)(4) (i) or (ii) shall represent all vehicles in the same evaporative emission family-evaporative emission control system combination.

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the vehicles (or engines) belonging to an engine family or engine combination (as applicable), all of which comply with all applicable standards (or family emission limits, as appropriate).

(3) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to § 86.090-29, data or information derived from any inspection carried out under § 86.078-7(c) or any other pertinent data or information, the Administrator determines that one or more test vehicles (or test engines) of the certification test fleet do not meet applicable standards (or family emission limits, as appropriate), he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determination and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078-6 with respect to such issue.

(4) For light-duty vehicles and light-duty trucks the manufacturer may, at its option, proceed with any of the following alternatives with respect to an emission-data vehicle determined not in compliance with all applicable standards (or family emission limits, as appropriate) for which it was tested:

(i) Request a hearing under § 86.078-6; or

(ii) Remove the vehicle configuration (or evaporative vehicle configuration as applicable) which failed, from his application;

(A) If the failed vehicle was tested for compliance with exhaust emission standards (or family emission limits, as appropriate) only: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle to be tested for exhaust emission compliance only.

(B) If the failed vehicle was tested for compliance with both exhaust and evaporative emission standards: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle which will be tested for compliance with both exhaust and evaporative emission standards. If one vehicle cannot be selected in accordance with the selection criteria employed in selecting the failed vehicle, then two vehicles may be selected (*i.e.*, one vehicle to satisfy the exhaust emission vehicle selection criteria and one vehicle to satisfy the evaporative emission vehicle selection criteria). The vehicle selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards only. The vehicle selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards; or

(iii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed from the application and add a vehicle configuration(s) (or evaporative vehicle configuration(s), as applicable) not previously listed. The Administrator may require, if applicable, that the failed vehicle be modified to the new engine code (or evaporative emission code, as applicable) and demonstrate by testing that it meets applicable standards (or family emission limits, as appropriate) for which it was originally tested. In addition, the Administrator may select, in accordance with the vehicle selection criteria given in § 86.090–24(b), a new emission-data vehicle or vehicles. The vehicles selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards (or family emission limits, as appropriate) only. The vehicles selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards (or family emission limits, as appropriate); or

(iv) Correct a component or system malfunction and show that with a correctly functioning system or component the failed vehicle meets applicable standards (or family emission limits, as appropriate) for which it was originally tested. The Administrator may require a new emission-data vehicle, of identical vehicle configuration (or evaporative vehicle configuration, as applicable) to the failed vehicle, to be operated and tested for compliance with the applicable standards (or family emission limits, as appropriate) for which the failed vehicle was originally tested.

(5) For heavy-duty engines the manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test engine(s) determined not in compliance with applicable standards:

(i) Request a hearing under § 86.078–6; or

(ii) Delete from the application for certification the engines represented by the failing test engine. (Engines so deleted may be included in a later request for certification under § 86.079–32.) The Administrator may then select in place of each failing engine an alternative engine chosen in accordance with selection criteria employed in selecting the engine that failed; or

(iii) Modify the test engine and demonstrate by testing that it meets applicable standards. Another engine which is in all material respects the same as the first engine, as modified, may then be operated and tested in accordance with applicable test procedures.

(6) If the manufacturer does not request a hearing or present the required data under paragraph (b)(4) or (b)(5) of this section (as applicable), the Administrator will deny certification.

(c)(1) Notwithstanding the fact that any certification vehicle(s) (or certification engine(s)) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such vehicle(s) or engine(s)) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof;

(ii) The manufacturer renders inaccurate any test data which he submits pertaining thereto or otherwise circumvents the intent of the Act, or of this part with respect to such vehicle (or engine);

(iii) Any EPA Enforcement Officer is denied access on the terms specified in § 86.078-7(c) to any facility or portion thereof which contains any of the following:

(A) The vehicle (or engine);

(B) Any components used or considered for use in its modification or buildup into a certification vehicle (or certification engine);

(C) Any production vehicle (or production engine) which is or will be claimed by the manufacturer to be covered by the certificate;

(D) Any step in the construction of a vehicle (or engine) described in paragraph (c)(iii)(C) of this section;

(E) Any records, documents, reports, or histories required by this part to be kept concerning any of the above;

(iv) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 86.078-7(c)) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(2) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraph (c)(1) (i), (ii), (iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void *ab initio*.

(4) In any case in which certification of a vehicle (or engine) is proposed to be withheld, denied, revoked, or suspended under paragraph (c)(1) (iii) or (iv) of this section, and in which the Administrator has presented to the manufacturer involved, reasonable evidence that a violation of § 86.078-7(c) in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle (or engine) in question was not involved in the violation to a degree that would warrant withholding, denial, revocation, or suspension of certification under either paragraph (c)(1) (iii) or (iv) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(5) Any revocation or suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.078-6 hereof.

(ii) Extend no further than to forbid the introduction into commerce of vehicles (or engines) previously covered by the certification which are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes the certification invalid *ab initio*.

(6) The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Administrator under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with § 86.078-6. If the Administrator finds, after a review of the request and supporting data, that the request raises a substantial factual issue, he will grant the request with respect to such issue.

(d)(1) *For light duty vehicles.* Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.603; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.603; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.609; or

(iv) The manufacturer renders inaccurate any test data which he submits pursuant to § 86.609; or

(v) Any EPA Enforcement Officer is denied the opportunity to conduct activities related to entry and access as authorized in § 86.606 of this part and in a warrant or court order presented to the manufacturer or the party in charge of a facility in question; or

(vi) EPA Enforcement Officers are unable to conduct activities related to entry and access or to obtain "reasonable assistance" as authorized in § 86.606 of this part because a manufacturer has located its facility in a foreign jurisdiction where local law prohibits those activities; or

(vii) The manufacturer refuses to or in fact does not comply with § 86.604(a), 86.605, 86.607, 86.608, or 86.610.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraph (d)(1) (i), (ii), or (vii) of this section where the refusal is caused by conditions and circumstances outside the control of the manufacturer which render it impossible to comply with those requirements.

(3) The sanction of suspending a certificate may be imposed for the reasons in paragraph (d)(1) (iii), (iv), or (v) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a vehicle is proposed to be suspended under paragraph (d)(1)(v) of this section and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.606 in fact occurred, if the manufacturer wishes to content that, although the violation occurred, the vehicle configuration or engine family in question was not involved in the violation to a degree that would warrant suspension of certification under paragraph (d)(1)(v) of this section, the manufacturer shall have the burden of establishing the contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (d)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.614; and

(ii) Not apply to vehicles no longer in the hands of the manufacturer.

(7) Any voiding of a certificate of conformity under paragraph (d)(4) of this section will be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.614.

(e) *For light-duty trucks and heavy-duty engines.* (1) Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle or engine configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.1003; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.1003; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.1009; or

(iv) The manufacturer renders inaccurate any test data submitted pursuant to § 86.1009; or

(v) Any EPA Enforcement Officer is denied the opportunity to conduct activities related to entry and access as authorized in § 86.1006 of this part and in a warrant or court order presented to the manufacturer or the party in charge of a facility in question; or

(vi) EPA Enforcement Officers are unable to conduct activities related to entry and access as authorized in § 86.1006 of this part because a manufacturer has located a facility in a foreign jurisdiction where local law prohibits those activities; or

(vii) The manufacturer refuses to or in fact does not comply with the requirements of §§ 86.1004(a), 86.1005, 86.1007, 86.1008, 86.1010, 86.1011, or 86.1013.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraphs (e)(1) (i), (ii), or (vii) of this section where such refusal or denial is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but are not limited to, any uncontrollable factors which result in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturers to adequately plan for and provide the equipment and personnel needed to conduct tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanction of suspending a certificate may be imposed for the reasons outlined in paragraph (e)(1) (iii), (iv), or (v) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a light-duty truck or heavy-duty engine is proposed to be suspended under paragraph (e)(1)(v) of this section and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.1006 in fact occurred, if the manufacturer wishes to contend that, although the violation occurred, the vehicle or engine configuration or engine family in question was not involved in the violation to a degree that would warrant suspension of certification under paragraph (e)(1)(v) of this section, he shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (e)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014, and

(ii) Not apply to vehicles or engines no longer in the hands of the manufacturer.

(7) Any voiding of a certificate of conformity under paragraph (e)(4) of this section shall be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014.

[54 FR 14488, Apr. 11, 1989]

§ 86.090–35 Labeling.

(a) The manufacturer of any motor vehicle (or motor vehicle engine) subject to the applicable emission standards (and family emission limits, as appropriate) of this subpart, shall, at the time of manufacture, affix a permanent legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles (or engines) available for sale to the public and covered by a certificate of conformity under § 86.090-30(a).

(1) *Light-duty vehicles.* (i) A permanent, legible label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicles Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches), engine family identification and evaporative family identification;

(D) Engine tune-up specifications and adjustments, as recommended by the manufacturer in accordance with the applicable emission standards (or family emission limits, as appropriate), including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (*e.g.*, idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable), as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tune-up and what accessories (*e.g.*, air conditioner), if any, should be in operation;

(E) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to light duty vehicles;

(F) For vehicles which are part of the diesel particulate averaging program, the family particulate emission limit to which the vehicle is certified;

(G) For vehicles that have been exempted from compliance with the emission standard at high altitude, as specified in § 86.087-8(h):

(*1*) A highlighted statement (*e.g.*, underscored or boldface letters) that the vehicle is certified to applicable emission standards at low altitude only;

(*2*) A statement that the vehicle's unsatisfactory performance under high-altitude conditions makes it unsuitable for principal use at high altitude, and

(*3*) A statement that the emission performance warranty provisions of 40 CRF Part 85, Subpart V do not apply when the vehicle is tested at high altitude, and

(H) For vehicles that have been exempted from compliance with the emission standards at low altitude, as specified in § 86.087-8(i),

(*1*) A highlighted statement (*e.g.*, underscored or boldface letters) that the vehicle is certified to applicable emission standards at high altitude only, and

(*2*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart V do not apply when the vehicle is tested at low altitude.

(2) *Light-duty trucks.* (i) A legible, permanent label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label.

(A) The label heading: Important Vehicle Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family identification;

(D) Engine tune-up specifications and adjustments, as recommended by the manufacturer in accordance with the applicable emission standards (or family emission limits, as appropriate), including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (*e.g.*, idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable), as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tune-up and what accessories (*e.g.*, air conditioner), if any, should be in operation. If adjustments or modifications to the vehicle are necessary to insure compliance with emission standards (or family emission limits, as appropriate) at either high or low altitude, the manufacturer shall either include the instructions for such adjustments on the label, or indicate on the label where instructions for such adjustments may be found. The label shall indicate whether the engine tune-up or adjustment specifications are applicable to high altitude, low altitude or both;

(E) The prominent statement: "This vehicle conforms to U.S. EPA regulations applicable to 19___ Model Year New Light-Duty Trucks."

(F) If the manufacturer is provided an alternate useful-life period under the provisions of § 86.090–21(f), the prominent statement: "This vehicle has been certified to meet U.S. EPA standards for a useful-life period of ___ years or ___ miles of operation, whichever occurs first. This vehicle's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than years of miles (*e.g.*, hours, or miles only);

(G) A statement, if applicable, that the adjustments or modifications indicated on the label are necessary to ensure emission control compliance at the altitude specified;

(H) A statement, if applicable, that the high-altitude vehicle was designated or modified for principal use at high altitude. This statement must be affixed by the manufacturer at the time of assembly or by any dealer who performs the high altitude modification or adjustment prior to sale to an ultimate purchaser;

(I) For vehicles that have been exempted from compliance with the high-altitude emission standards, as specified in § 86.090–9(g)(2),

(*1*) A highlighted statement (*e.g.*, underscored or boldface letters) that the vehicle is certified to applicable emission standards at low altitude only,

(*2*) A statement that the vehicle's unsatisfactory performance under high-altitude conditions makes it unsuitable for principal use at high altitude, and

(*3*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart I do not apply when the vehicle is tested at high altitude; and

(J) For vehicles which are included in the diesel particulate averaging program, the family particulate emission limit to which the vehicle is certified.

(K) For vehicles which are included in the light-duty truck NO_x averaging program, the family NO_x emission limit to which the vehicle is certified.

(3) *Heavy-duty engines.* (i) A permanent legible label shall be affixed to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Important Engine Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family and model designations;

(D) Date of engine manufacture (month and year). The manufacturer may, in lieu of including the date of manufacture on the engine label, maintain a record of the engine manufacture dates. The manufacturer shall provide the date of manufacture records to the Administrator upon request;

(E) Engine specifications and adjustments as recommended by the manufacturer. These specifications should indicate the proper transmission position during tuneup and what accessories (*e.g.*, air conditioner), if any, should be in operation;

(F) For Otto-cycle engines the label should include the idle speed, ignition timing, and the idle air fuel mixture setting procedure and value (*e.g.*, idle CO, idle air-fuel ratio, idle speed drop), and valve lash;

(G) For diesel engines the label should include the advertised hp at rpm, fuel rate at advertised hp in mm^3/stroke, valve lash, initial injection timing, and idle speed;

(H) The prominent statement: "This engine conforms to U.S. EPA regulations applicable to 19___ Model Year New Heavy-Duty Engines."

(*I*) If the manufacturer is provided with an alternate useful-life period under the provisions of § 86.090-21(f), the prominent statement: "This engine has been certified to meet U.S. EPA standards for a useful-life period of ___ miles or ___ hours of operation, whichever occurs first. This engine's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than miles or hours (*e.g.*, years, or hours only):

(*J*) *For diesel engines.* The prominent statement: "This engine has a primary intended service application as a _____-heavy-duty engine." (The primary intended service applications are light, medium, and heavy, as defined in § 86.085-2);

(*K*) *For Otto-cycle engines.* One of the following statements, as applicable:

(*1*) For engines certified to the emission standards under § 86.090-10(a)(1)(i) or § 86.090-10(a)(1)(iii), the statement: "This engine is certified for use in all heavy-duty vehicles."

(*2*) For gasoline-fueled engines certified under the provisions of § 86.090-10(a)(3)(i), the statement: "This engine is certified for use in all heavy-duty vehicles under the special provision of 40 CFR 86.090-10(a)(3)(i)."

(*3*) For engines certified to the emission standards of § 86.090-10(a)(1)(ii) or § 86.090-10(a)(1)(iv), the statement: "This engine is certified for use only in heavy-duty vehicles with a gross vehicle weight rating above 14,000 lbs."

(iv) The label may be made up of one or more pieces: *Provided*, that all pieces are permanently attached to the same engine or vehicle part as applicable.

(4)(i) *Gasoline-fueled and methanol-fueled heavy-duty vehicles.* A permanent, legible label shall be affixed in a readily visible position in the engine compartment. If such vehicles do not have an engine compartment, the label required in paragraphs (a)(4) and (g)(1) of this section shall be affixed in a readily visible position on the operator's enclosure or on the engine.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicles Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Evaporative family identification;

(D) The maximum nominal fuel tank capacity (in gallons) for which the evaporative control system is certified; and

(E) One of the following, as appropriate:

(*1*) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to gasoline-fueled heavy-duty vehicles.

(*2*) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to methanol-fueled heavy-duty vehicles.

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle (or engine) conforms to any applicable state emission standards for new motor vehicles (or new motor vehicle engines) or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the vehicle (or engine).

(c)(1) The manufacturer of any light-duty vehicle or light-duty truck subject to the emission standards (or family emission limits, as appropriate) of this subpart shall, in addition and subsequent to setting forth those statements on the label required by the Department of Transportation (DOT) pursuant to 49 CFR 567.4, set forth on the DOT label or on an additional label located in proximity to the DOT label and affixed as described in 40 CFR 567.4(b), the following information in the English language, lettered in block letters and numerals not less than three thirty-seconds of an inch high, of a color that contrasts with the background of the label:

(i) The Heading: "Vehicle Emission Control Information."

(ii)(A) *For light duty vehicles,* the statement: "This Vehicle Conforms to U.S. EPA Regulations Applicable to 19__ Model Year New Motor Vehicles."

(B) *For light-duty trucks.* (*1*) The statement: "This vehicle conforms to U.S. EPA Regulations Applicable to 19__ Model Year New Light-Duty Trucks."

(*2*) If the manufacturer is provided an alternate useful-life period under the provisions of § 86.090-21(f), the prominent statement: "This vehicle has been certified to meet U.S. EPA standards for a useful-life period of __ years or ____ miles of operation, whichever occurs first. This vehicle's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than years or miles (*e.g.,* hours, or miles only).

(iii) One of the following statements, as applicable, in letters and numerals not less than six thirty-seconds of an inch high and of a color that contrasts with the background of the label:

(A) For all vehicles certified as non-catalyst- equipped: "NON-CATALYST."

(B) For all vehicles certified as catalyst-equipped which are included in a manufacturer's catalyst control program for which approval has been given by the Administrator: "CATALYST-APPROVED FOR IMPORT."

(C) For all vehicles certified as catalyst-equipped which are not included in a manufacturer's catalyst control program for which prior approval has been given by the Administrator: "CATALYST."

(2) In lieu of selecting either of the labeling options of paragraph (c)(1) of this section, the manufacturer may add the information required by paragraph (c)(1)(iii) of this section to the label required by paragraph (a) of this section. The required information will be set forth in the manner prescribed by paragraph (c)(1)(iii) of this section.

(d) Incomplete light-duty trucks or incomplete heavy-duty vehicles optionally certified as light-duty trucks shall have the following prominent statement printed on the label required by paragraph (a)(2) of this section in lieu of the statement required by paragraph (a)(2)(iii)(E) of this section: "This vehicle conforms to U.S. EPA regulations applicable to 19— Model Year New Light-Duty Trucks when completed at a maximum curb weight of ____ pounds or at a maximum gross vehicle weight rating of ____ pounds or with a maximum frontal area of ____ square feet."

(e) Incomplete heavy duty vehicles having a gross vehicle weight rating of 8,500 pounds or less shall have one of the following statements printed on the label required by paragraph (a)(3) of this section in lieu of the statement required by paragraph (a)(3)(iii)(H) of this section: "This engine conforms to U.S. EPA regulations applicable to 19— Model Year New Heavy-Duty Engines when installed in a vehicle completed at a curb weight of more than 6,000 pounds or with a frontal area of greater than 45 square feet."

(f) The manufacturer of any incomplete light-duty vehicle or light-duty truck shall notify the purchaser of such vehicle of any curb weight, frontal areas, or gross vehicle weight rating limitations affecting the emission certificate applicable to that vehicle. This notification shall be transmitted in a manner consistent with National Highway Traffic Safety Administration Safety notification requirements published in 49 CFR Part 568.

(g)(1)(i) Incomplete gasoline-fueled heavy-duty vehicles shall have the following prominent statement printed on the label required in paragraph (a)(4) of this section: "(Manufacturer's corporate name) has determined that this vehicle conforms to U.S. EPA regulations applicable to 19— Model Year New Gasoline-Fueled Heavy-Duty Vehicles when completed with a nominal fuel tank capacity not to exceed — gallons. Persons wishing to add fuel tank capacity beyond the above maximum must submit a written statement to the Administrator that the hydrocarbon storage system has been upgraded according to the requirements of 40 CFR 86.090-35(g)(2)."

(ii) Incomplete methanol-fueled heavy-duty vehicles shall have the following prominent statement printed on the label required in paragraph (a)(4) of this section: "(Manufacturer's corporate name) has determined that this vehicle conforms to U.S. EPA regulations applicable to 19— Model Year New Methanol-Fueled Heavy-Duty Vehicles when completed with a nominal fuel tank capacity not to exceed ___ gallons. Persons wishing to add fuel tank capacity beyond the above maximum must submit a written statement to the Administrator that the hydrocarbon storage system has been upgraded according to the requirements of 40 CFR 86.090-35(g)(2)."

(2) Persons wishing to add fuel tank capacity beyond the maximum specified on the label required in paragraph (g)(1) of this section shall:

(i) Increase the amount of fuel tank vapor storage material according to the following function:

$$\mathrm{Cap}_f = \mathrm{Cap}_i \left(\frac{\mathrm{T.\ Vol.}}{\mathrm{Max.\ Vol.}} \right)$$

Where:

Cap_f=final amount of fuel tank vapor storage material, grams.

Cap_i=initial amount of fuel tank vapor storage material, grams.

T. Vol.=total fuel tank volume of completed vehicle, gallons.

Max. Vol.=maximum fuel tank volume as specified on the label required in paragraph (g)(1) of this section, gallons.

(ii) Use, if applicable, hosing for fuel vapor routing which is at least as impermeable to hydrocarbon vapors as that used by the primary manufacturer.

(iii) Use vapor storage material with the same absorptive characteristics as that used by the primary manufacturer.

(iv) Connect, if applicable, any new hydrocarbon storage device to the existing hydrocarbon storage device in series such that the original hydrocarbon storage device is situated between the fuel tank and the new hydrocarbon storage device. The original hydrocarbon storage device shall be sealed such that vapors cannot reach the atmosphere. The elevation of the original hydrocarbon storage device shall be equal to or lower than the new hydrocarbon storage device.

(v) Submit a written statement to the Administrator that paragraphs (g)(2)(i) through (g)(2)(iv) of this section have been complied with.

(3) If applicable, the Administrator will send a return letter verifying the receipt of the written statement required in paragraph (g)(2)(v) of this section.

(h)(1) Light-duty trucks and heavy duty engines for which nonconformance penalties are to be paid in accordance with § 86.1113-87(b) shall have the following information printed on the label required in paragraph (a) of this section or on a separate permanent legible label in the English language and located in proximity to the label required in paragraph (a) of this section. The manufacturer shall begin labeling production engines or vehicles within 10 days after the completion of the PCA.

(i) The statement: "The manufacturer of this engine/vehicle will pay a penalty to be allowed to introduce it into commerce at an emission level higher than the applicable emission standard. The compliance level (or new emission standard) for this engine/vehicle is _____." (The manufacturer shall insert the applicable pollutant and compliance level calculated in accordance with § 86.1112-87(a).)

(2) If a manufacturer introduces an engine or vehicle into commerce prior to the compliance level determination of § 86.1112-87(a), it shall provide the engine or vehicle owner with a label as described above to be affixed in a location in proximity to the label required in paragraph (a) of this section within 30 days of the completion of the PCA.

[54 FR 14488, Apr. 11, 1989]

§ 86.091-2 Definitions.

The definitions of § 86.090-2 remain effective. The definitions listed in this section apply beginning with the 1991 model year.

Production-weighted NO_x average, for heavy-duty engines, means the average of the manufacturer's family NO_x emission limits within the subclass (gasoline-fueled; or, light, medium, or heavy diesel) being averaged, weighted to account for differences in production volume and rated BHP. It is calculated at the end of the model year for determining compliance with the standard by summing, for all engine families in the subclass being averaged, the products (per engine family) of production volume, BHP rating, and the family NO_x emission limit, and dividing by the sum, for these engine families, of the products (per engine family) of production volume and BHP rating. Expressed mathematically, the calculation is as follows:

Production-weighted NO_x Average =

$$\frac{\sum_{i=1}^{n}\left[(PROD_i \times BHP_i \times FEL_i)\right]}{\sum_{i=1}^{n}\left[(PROD_i \times BHP_i)\right]}$$

Where:

n = the number of engine families included in the subclass (gasoline-fueled; or, light, medium, or heavy diesel) being averaged.

PROD = the manufacturer's production of a given engine family during the model year.

BHP = the production-weighted horsepower rating for that engine family, in brake horsepower.

FEL = the family NO_x emission limit for that engine family, in grams per brake horsepower-hour.

Those engines produced for sale in California or in 49-state areas shall each be averaged separately. Gasoline-fueled engines shall be averaged separately from diesel engines. Engines for use in urban buses may be averaged with other engines of the same subclass.

Production-weighted particulate average, for heavy-duty diesel engines, means the average of the manufacturer's family particulate emission limits within the subclass (light, medium, or heavy) being averaged, weighted to account for differences in production volume and rated BHP. It is calculated at the end of the model year for determining compliance with the standard by summing, for all engine families in the subclass being averaged, the products (per engine family) of production volume, BHP rating, and family particulate emission limit, and dividing by the sum, for these engine families, of the products (per engine family) of production volume and BHP rating. Expressed mathematically, the calculation is as follows:

Production-weighted particulate average =

$$\frac{\sum_{i=1}^{n}\left[(PROD_i \times BHP_i \times FEL_i)\right]}{\sum_{i=1}^{n}\left[(PROD_i \times BHP_i)\right]}$$

Where:

n = the number of engine families included in the subclass (light, medium, or heavy) being averaged.

PROD = the manufacturer's production of a given engine family during the model year.

BHP = the production-weighted horsepower rating for that engine family, in brake horsepower.

FEL = the family particulate emission limit for that engine family, in grams per brake horsepower-hour.

Those engines produced for sale in California or in 49-state areas shall each be averaged separately. Engines for use in urban buses shall be excluded from participation in the particulate averaging program.

Urban bus means a heavy-duty diesel-powered passenger-carrying vehicle with a load capacity of fifteen or more passengers and intended primarily for intra-city operation, *i.e.*, within the confines of a city or greater metropolitan area. Urban bus operation is characterized by short rides and frequent stops. To facilitate this type of operation, more than one set of quick-opening entrance and exist doors would normally be installed. Since fares are usually paid in cash or tokens rather than purchased in advance in the form of tickets, urban buses would normally have equipment installed for collection of fares. Urban buses are also typically characterized by the absence of equipment and facilities for long distance travel, *e.g.*

rest rooms, large luggage compartments, and facilities for stowing carry-on luggage.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10649, Mar. 15, 1985, as amended at 54 FR 14612, Apr. 11, 1989]

§ 86.091-9 Emission standards for 1991 and later model year light-duty trucks.

(a)(1) The standards set forth in paragraphs (a) through (c) of this section shall apply to light-duty trucks sold for principal use at other than a designated high-altitude location. Exhaust emissions from 1991 and later model year light-duty trucks shall not exceed:

(i)(A) *Hydrocarbons (for petroleum-fueled Otto-cycle and diesel light-duty trucks).* 0.80 gram per vehicle mile (0.50 gram per vehicle kilometer).

(B) *Organic Material Hydrocarbon Equivalent (for methanol-fueled Otto-cycle and diesel light-duty trucks).* 0.80 gram per vehicle mile (0.50 gram per vehicle kilometer).

(ii) *Carbon monoxide.*

(A) 10 grams per vehicle mile (6.2 grams per vehicle kilometer).

(B) 0.50 percent of exhaust gas flow at curb idle (for Otto-cycle and methanol-fueled diesel light-duty trucks only).

(iii) *Oxides of nitrogen.*

(A) For light-duty trucks up to and including 3,750 lbs loaded vehicle weight, 1.2 grams per vehicle mile (0.75 gram per vehicle kilometer).

(B) For light-duty trucks greater loaded vehicle weight, 1.7 grams per vehicle mile (1.1 grams per vehicle kilometer).

(C) A manufacturer may elect to include all or some of its light-duty truck engine families in the NO_x averaging program, provided that trucks produced for sale in California or in designated high-altitude areas may be averaged only within each of those areas. Petroleum-fueled and methanol-fueled engine families may not be averaged together. Otto-cycle and diesel engines families also may not be averaged together. If the manufacturer elects to participate in the NO_x averaging program, individual familyNO_x emission limits may not exceed 2.3 grams per mile. If the manufacturer elects to average together NO_x emissions of light-duty trucks subject to the standards of paragraphs (a)(1)(iii)(A) and (a)(1)(iii)(B) of this section, its composite NO_x standard applies to the combined fleets of light-duty trucks up to and including, and over, 3,750 lbs loaded vehicle weight included in the average and is calculated as defined in § 86.088-2.

(iv) *Particulate (for diesel light-duty trucks only).*

(A) For light-duty trucks up to and including 3,750 lbs loaded vehicle weight, 0.26 gram per vehicle mile (0.16 gram per vehicle kilometer).

(B) For light-duty trucks 3,751 lbs and greater loaded vehicle weight, 0.13 gram per vehicle mile (0.08 gram per vehicle kilometer).

(C) A manufacturer may elect to include all or some of its diesel light-duty truck engine families in the appropriate particulate averaging program (petroleum or methanol), provided that trucks produced for sale in California or in designated high-altitude areas may be averaged only within each of those areas, and that light-duty trucks subject to the standard of paragraph (a)(1)(iv)(B) of this section may be averaged only with other light-duty trucks subject to the standard of paragraph (a)(1)(iv)(B) of this section. Averaging is not permitted between fuel types. If the manufacturer elects to average both light-duty trucks subject to the standard of paragraph (a)(1)(iv)(A) of this section and light-duty vehicles together in the appropriate particulate averaging program, its composite particulate standard applies to the combined set of light-duty vehicles and light-duty trucks included in the average and is calculated as defined in § 86.088-2.

(2) The standards set forth in paragraphs (a)(1)(i), (a)(1)(ii)(A), (a)(1)(iii), and (a)(1)(iv) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures. The standard set forth in paragraph (a)(1)(ii)(B) of this section refers to the exhaust emitted at curb idle and measured and calculated in accordance

with the procedures set forth in Subpart P of this part.

(b) Fuel evaporative emissions from 1991 and later model year light-duty trucks shall not exceed (compliance with these standards is optional for 1991 model year methanol-fueled vehicles):

(1) *Hydrocarbons (for gasoline-fueled light-duty trucks).* 2.0 grams per test.

(2) *Organic Material Hydrocarbon Equivalent (for methanol-fueled light-duty trucks).* 2.0 grams per test.

(3) The standards set forth in paragraphs (b) (1) and (2) of this section refer to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1991 and later model year light-duty truck.

(d)(1) Model year 1991 and later light-duty trucks sold for principal use at a designated high-altitude location shall be capable of meeting the following exhaust emission standards when tested under high-altitude conditions:

(i)(A) *Hydrocarbons (for petroleum-fueled Otto-cycle and diesel light-duty trucks).* 1.0 grams per vehicle mile (0.62 grams per vehicle kilometer).

(B) *Organic Material Hydrocarbon Equivalent (for methanol-fueled Otto-cycle and diesel light-duty trucks).* 1.0 gram per vehicle mile (0.62 gram per vehicle kilometer).

(ii) *Carbon Monoxide.* (A) 14 grams per vehicle mile (8.7 grams per vehicle kilometer).

(B) 0.50 percent of exhaust gas flow at curb idle (for Otto-cycle and methanol-fueled diesel light duty trucks only).

(iii) *Oxides of Nitrogen.* (A) For light-duty trucks up to and including 3,750 lbs loaded vehicle weight, 1.2 grams per vehicle mile (0.75 grams per vehicle kilometer).

(B) For light-duty trucks 3,751 lbs and greater loaded vehicle weight, 1.7 grams per vehicle mile (1.1 grams per vehicle kilometer).

(iv) *Particulate (for diesel light-duty trucks only).* (A) For light-duty trucks up to and including 3,750 lbs loaded vehicle weight, 0.26 gram per vehicle mile (0.16 gram per vehicle kilometer).

(B) For light-duty trucks 3,751 lbs and greater loaded vehicle weight, 0.13 gram per vehicle mile (0.08 gram per vehicle kilometer).

(2) The standards set forth in paragraphs (d)(1)(i), (d)(1)(ii)(A), (d)(1)(iii), and (d)(1)(iv) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures. The standard set forth in paragraph (d)(1)(ii)(B) of this section refers to the exhaust emitted at curb idle and measured and calculated in accordance with the procedures set forth in Subpart P of this part.

(e) Fuel evaporative emissions from 1991 and later model year light-duty trucks sold for principal use at a designated high-altitude location, when tested under high-altitude conditions, shall not exceed:

(1) *Hydrocarbons (for gasoline-fueled light-duty trucks).* 2.6 grams per test.

(2) *Organic Material Hydrocarbon Equivalent (for methanol-fueled light-duty trucks).* 2.6 grams per test.

(3) The standards set forth in paragraphs (e) (1) and (2) of this section refer to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(f) No crankcase emissions shall be discharged into the ambient atmosphere from any 1991 and later model year light-duty trucks sold for principal use at a designated high-altitude location.

(g)(1) Any light-duty truck that a manufacturer wishes to certify for sale at low altitude must be capable of meeting high-altitude emission standards (specified in paragraphs (d) through (f) of this section). The manufacturer may specify vehicle adjustments or modifications to allow the vehicle to meet high-altitude standards but these adjustments or modifications may not alter the vehicle's basic engine, inertia weight class, transmission configuration, and axle ratio.

(i) A manufacturer may certify unique configurations to meet the high-altitude standards but is not required to certify these vehicle configurations to meet the low-altitude standards.

(ii) Any adjustments or modifications that are recommended to be performed on vehicles to satisfy the requirements of paragraph (g)(1) of this section:

(A) Shall be capable of being effectively performed by commercial repair facilities, and

(B) Must be included in the manufacturer's application for certification.

(2) The manufacturer may exempt 1991 and later model year vehicles from compliance with the high-altitude emission standards set forth in paragraphs (d) and (e) of this section if the vehicles are not intended for sale at high altitude and if the following requirements are met. A vehicle configuration shall only be considered eligible for exemption if the requirements of either paragraph (g)(2) (i), (ii), (iii), or (iv) of this section are met.

(i) Its design parameters (displacement-to-weight ratio (D/W) and engine speed-to-vehicle-speed ratio (N/V)) fall within the exempted range for that manufacturer for that year. The exempted range is determined according to the following procedure:

(A) The manufacturer shall graphically display the D/W and N/V data of all vehicle configurations it will offer for the model year in question. The axis of the abscissa shall be D/W (where (D) is the engine displacement expressed in cubic centimeters and (W) is the gross vehicle weight (GVW) expressed in pounds), and the axis of the ordinate shall be N/V (where (N) is the crankshaft speed expressed in revolutions per minute and (V) is the vehicle speed expressed in miles per hour). At the manufacturer's option, either the 1:1 transmission gear ratio or the lowest numerical gear ratio available in the transmission will be used to determine N/V. The gear selection must be the same for all N/V data points on the manufacturer's graph. For each transmission/axle ratio combination, only the lowest N/V value shall be used in the graphical display.

(B) The product line is then defined by the equation, $N/V=C(D/W)^{-0.9}$ where the constant, C, is determined by the requirement that all the vehicle data points either fall on the line or lie to the upper right of the line as displayed on the graphs.

(C) The exemption line is then defined by the equation, $N/V=C(0.84\ D/W)^{-0.9}$ where the constant, C, is the same as that found in paragraph (g)(2)(i)(B) of this section.

(D) The exempted range includes all values of N/V and D/W which simultaneously fall to the lower left of the exemption line as drawn on the graph.

(ii) Its design parameters fall within the alternate exempted range for that manufacturer that year. The alternate exempted range is determined by substituting rated horsepower (hp) for displacement (D) in the exemption procedure described in paragraph (g)(2)(i) of this section and by using the product line $N/V=C(hp/W)^{-0.9}$.

(A) Rated horsepower shall be determined by using the Society of Automotive Engineers Test Procedure J 1349, or any subsequent version of that test procedure. Any of the horsepower determinants within that test procedure may be used, as long as it is used consistently throughout the manufacturer's product line in any model year.

(B) No exemptions will be allowed under paragraph (g)(2)(ii) of this section to any manufacturer that has exempted vehicle configurations as set forth in paragraph (g)(2)(i) of this section.

(iii) Its acceleration time (the time it takes a vehicle to accelerate from 0 to a speed not less than 40 miles per hour and not greater than 50 miles per hour) under high-altitude conditions is greater than the largest acceleration time under low-altitude conditions for that manufacturer for that year. The procedure to be followed in making this determination is:

(A) The manufacturer shall list the vehicle configuration and acceleration time under low-altitude conditions of that vehicle configuration which has the highest acceleration time under low-altitude conditions of all the vehicle configurations it will offer for the model year in question. The manufacturer shall also submit a description of the methodology used to make this determination.

(B) The manufacturer shall then list the vehicle configurations and acceleration times under high-altitude conditions of all those vehicles configurations which have higher acceleration times under high-altitude conditions than the highest acceleration time at low altitude identified in paragraph (g)(2)(iii)(A) of this section.

(iv) In lieu of performing the test procedure of paragraph (g)(2)(iii) of this section, its acceleration time can be estimated based on the manufacturer's engineering evaluation, in accordance with good engineering practice, to meet the exemption criteria of paragraph (g)(2)(iii) of this section.

(3) The sale of a vehicle for principal use at a designated high-altitude location that has been exempted as set forth in paragraph (g)(2) of this section will be considered a violation of section 203(a)(1) of the Clean Air Act.

[53 FR 43876, Oct. 31, 1988, as amended at 54 FR 14612, Apr. 11, 1989]

§ 86.091-10 Emission standards for 1991 and later model year Otto-cycle heavy-duty engines and vehicles.

(a)(1) Exhaust emissions from new 1991 and later model year Otto-cycle heavy-duty engines shall not exceed:

(i) For *gasoline-fueled Otto-cycle engines* intended for use in all vehicles except as provided in paragraph (a)(3) of this paragraph,

(A) *Hydrocarbons.* 1.1 grams per brake horsepower-hour (0.41 gram per megajoule), as measured under transient operating conditions.

(B) *Carbon monoxide.* (*1*) 14.4 grams per brake horsepower-hour (5.36 grams per megajoule), as measured under transient operating conditions.

(*2*) *For gasoline-fueled Otto-cycle heavy-duty engines utilizing after-treatment technology.* 0.50 percent of exhaust gas flow at curb idle.

(C) *Oxides of nitrogen.* (*1*) 5.0 grams per brake horsepower-hour (1.9 grams per megajoule), as measured under transient operating conditions.

(*2*) A manufacturer may elect to include some or all of its gasoline-fueled Otto-cycle heavy-duty engine families in the heavy-duty engine NO_x averaging program, provided that engines produced for sale in California or in 49-state areas may be averaged only within each of those areas. Averaging is limited to within fuel types (gasoline and methanol). If the manufacturer elects to participate in the NO_x averaging program, individual family NO_x emission limits may not exceed 6.0 grams per brake horsepower-hour (2.2 grams per megajoule).

(ii) For *gasoline-fueled Otto-cycle engines* intended for use only in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 lbs.

(A) *Hydrocarbons.* 1.9 grams per brake horsepower-hour (0.71 gram per megajoule), as measured under transient operating conditions.

(B) *Carbon Monoxide.* (*1*) 37.1 grams per brake horsepower-hour (13.8 grams per megajoule), as measured under transient operating conditions.

(*2*) *For gasoline-fueled Otto-cycle heavy-duty engines utilizing after-treatment technology.* 0.50 percent of exhaust gas flow at curb idle.

(C) *Oxides of nitrogen.* (*1*) 5.0 grams per brake horsepower-hour (1.9 grams per megajoule), as measured under transient operating conditions.

(*2*) A manufacturer may elect to include some or all of its gasoline-fueled Otto-cycle heavy-duty engine families in the heavy-duty engine NO_x averaging program, as described in paragraph (a)(1)(i)(C)(*2*) of this section.

(iii) For *methanol-fueled Otto-cycle heavy-duty engines* intended for use in all vehicles, except as provided in paragraph (a)(3) of this section.

(A) *Organic Material Hydrocarbon Equivalent.* 1.1 gram per brake horsepower-hour (0.41 gram per megajoule), as measured under transient operating conditions.

(B) *Carbon monoxide.* (*1*) 14.4 grams per brake horsepower-hour (5.36 grams per megajoule), as measured under transient operating conditions.

(*2*) 0.50 percent of exhaust gas flow at curb idle.

(C) *Oxides of nitrogen.* (*1*) 5.0 grams per brake horsepower-hour (1.9 grams per megajoule), as measured under transient operating conditions.

(*2*) A manufacturer may elect to include some or all of its methanol-fueled Otto-cycle engine families in the heavy-duty NO_x averaging program, as described in paragraph (a)(1)(i)(C)(*2*) of this section.

(iv) For *methanol-fueled Otto-cycle heavy-duty engines* intended for use only in vehicles with a Gross Vehicle Weight Rating of greater than 14,000 lbs.

(A) *Organic Material Hydrocarbon Equivalent.* 1.9 grams per brake horsepower-hour (0.71 gram per megajoule), as measured under transient operating conditions.

(B) *Carbon monoxide.* (*1*) 37.1 grams per brake horsepower-hour (13.8 grams per megajoule), as measured under transient operating conditions.

(*2*) 0.50 percent of exhaust gas flow at curb idle.

(C) *Oxides of nitrogen.* (*1*) 5.0 grams per brake horsepower-hour (1.9 grams per megajoule), as measured under transient operating conditions.

(*2*) A manufacturer may elect to include some or all of its methanol-fueled Otto-cycle heavy-duty engine families in the heavy-duty NO_x averaging program, as described in paragraph (a)(1)(i)(C)(*2*) of this section.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over the operating schedule set forth in paragraph (f)(1) of Appendix I to this part, and measured and calculated in accordance with the procedures set forth in Subpart N or P.

(3)(i) A manufacturer may certify one or more gasoline-fueled Otto-cycle heavy-duty engine configurations intended for use in all vehicles to the emission standards set forth in paragraph (a)(1)(ii) of this section: *Provided,* that the total model year sales of such configuration(s) being certified to the emission standards in paragraph (a)(1)(ii) of this section represent no more than 5 percent of total model year sales of all gasoline-fueled Otto-cycle heavy-duty engines intended for use in vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds by the manufacturer.

(ii) A manufacturer may certify one or more methanol-fueled Otto-cycle heavy-duty engine configurations intended for use in all vehicles to the emission standards set forth in paragraph (a)(1)(iv) of this section: *Provided,* that the total model year sales of such configuration(s) being certified to the emission standards in paragraph a(1)(iv) of this section represent no more than 5 percent of total model year sales of all methanol-fueled Otto-cycle heavy-duty engines intended for use in vehicles with a Gross Vehicle Weight Rating of up to 14,000 pounds by the manufacturer.

(iii) The configurations certified to the emission standards of paragraphs (a)(1) (ii) and (iv) of this section under the provisions of paragraphs (a)(3) (i) and (ii) of this section shall still be required to meet the evaporative emission standards set forth in paragraphs (b)(1)(i), (b)(2)(i) and (b)(3)(i) of this section.

(b) *Evaporative emissions* from 1991 and later model year heavy-duty vehicles shall not exceed:

(1) *Hydrocarbons (for vehicles equipped with gasoline-fueled engines).* (i) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 lbs, 3.0 grams per test.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 14,000 lbs, 4.0 grams per test.

(2) *Organic Material Hydrocarbon Equivalent (for vehicles equipped with methanol-fueled engines).*

(i) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 lbs, 3.0 grams per test.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 14,000 lbs, 4.0 grams per test.

(3)(i) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 lbs, the standards set forth in paragraphs (b)(1) and (b)(2) of this section refer to a composite sample of evaporative emissions collected under the conditions set forth in Subpart M and measured in accordance with those procedures.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 26,000 lbs., the standards set forth in paragraphs (b)(1)(ii) and (b)(2)(ii) of this section refer to the manufacturer's engineering design evaluation using good engineering practice (a statement of which is required in § 86.091–23(b)(4)(ii)).

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1991 or later model year Otto-cycle heavy-duty engine.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subpart N or P of this part to ascertain that such test engines meet the requirements of paragraphs (a) and (c) of this section.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10652, Mar. 15, 1985, as amended at 54 FR 14464, Apr. 11, 1989]

§ 86.091–11 Emission standards for 1991 and later model year diesel heavy-duty engines.

(a)(1) Exhaust emissions from new 1991 and later model year diesel heavy-duty engines shall not exceed the following:

(i)(A) *Hydrocarbons (for petroleum-fueled diesel engines).* 1.3 grams per brake horsepower-hour (0.48 gram per megajoule), as measured under transient operating conditions.

(B) *Organic Material Hydrocarbon Equivalent (for methanol-fueled diesel engines).* 1.3 grams per brake horsepower-hour (0.48 gram per megajoule), as measured under transient operating conditions.

(ii) *Carbon monoxide.* (A) 15.5 grams per brake horsepower-hour (5.77 grams per megajoule), as measured under transient operating conditions.

(B) 0.50 percent of exhaust gas flow at curb idle (methanol-fueled diesel only).

(iii) *Oxides of nitrogen.* (A) 5.0 grams per brake horsepower-hour (1.9 grams per megajoule), as measured under transient operating conditions.

(B) A manufacturer may elect to include some or all of its diesel heavy-duty engine families in the heavy-duty NO_x averaging program, provided that engines produced for sale in California or in 49 state areas may be averaged only within each of those areas. Averaging is limited to within fuel types (petroleum or methanol). Averaging is limited to engines within a given primary service class as defined in § 86.085–2. Averaging across primary service classes is not permitted. If the manufacturer elects to participate in the NO_x averaging program, individual family NO_x emission limits may not exceed 6.0 grams per brake horsepower-hour (2.2 grams per megajoule).

(iv) *Particulate.* (A) For diesel engines to be used in urban buses, 0.10 grams per brake horsepower-hour (0.037 gram per megajoule), as measured under transient operating conditions.

(B) For all other diesel engines only, 0.25 gram per brake horsepower-hour (0.093 gram per megajoule), as measured under transient operating conditions.

(C) A manufacturer may elect to include all or some of its diesel heavy-duty engine families, exclusive of engines to be used in urban buses, in the appropriate heavy-duty particulate averaging program (petroleum or methanol), provided that engines produced for sale in California or in 49-state areas may be averaged only within each of those areas. Averaging is not permitted between fuel types. Engines for use in urban buses may not be included in either heavy-duty particulate averaging program. Averaging is limited to engines within a given primary service class as defined in § 86.085–2. Averaging across primary service classes is not permitted. If the manufacturer elects to participate in either averaging program, individual family particulate limits may not exceed 0.60 gram per brake horsepower-hour (0.22 gram per megajoule).

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over operating schedules as set forth in paragraph (f)(2) of Appendix I of this part, and measured and calculated in accordance with the procedures set forth in Subpart N of this part, except as noted in § 86.091–23(c)(2) (i) and (iii).

(b)(1) The opacity of smoke emissions from new 1991 and later model year diesel heavy-duty engines shall not exceed:

(i) 20 percent during the engine acceleration mode.

(ii) 15 percent during the engine lugging mode.

(iii) 50 percent during the peaks in either mode.

(2) The standards set forth in paragraph (b)(1) of this section refer to exhaust smoke emissions generated under the conditions set forth in Subpart I of this part and measured and calculated in accordance with those procedures.

(3) *Evaporative emissions* (total of non-oxygenated hydrocarbons plus methanol) from 1991 and later model year heavy-duty vehicles equipped with methanol-fueled diesel engines shall not exceed:

(i) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 lbs, 3.0 grams per test.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 14,000 lbs, 4.0 grams per test.

(4)(i) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 lbs, the standards set forth in paragraph (b)(3) of this section refer to a composite sample of evaporative emissions collected under the conditions set forth in Subpart M and measured in accordance with those procedures.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 26,000 lbs, the standard set forth in paragraph (b)(3)(ii) of this section refers to the manufacturers, engineering design evaluation using good engineering practice (a statement of which is required in § 86.091-23(b)(4)(ii)).

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1991 or later model year methanol-fueled diesel, or any naturally-aspirated diesel heavy-duty engine. For petroleum fueled engines only, this provision does not apply to engines using turbochargers, pumps, blowers, or superchargers for air induction.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subpart I or N of this part to ascertain that such test engines meet the requirements of paragraphs (a), (b), and (c) and (d) of this section.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10653, Mar. 15, 1985, as amended at 54 FR 14465, Apr. 11, 1989]

§ 86.091-21 Application for certification.

(a) A separate application for a certificate of conformity shall be made for each set of standards (or family emission limits, as appropriate) and each class of new motor vehicles or new motor vehicle engines. Such application shall be made to the Administrator by the manufacturer and shall be updated and corrected by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1)(i) Identification and description of the vehicles (or engines) covered by the application and a description of their engine (vehicles only), emission control system and fuel system components. This shall include a detailed description of each auxiliary emission control device (AECD) to be installed in or on any certification test vehicle (or certification test engine).

(ii)(A) The manufacturer shall provide to the Administrator in the application for certification:

(*1*) A list of those parameters which are physically capable of being adjusted (including those adjustable parameters for which access is difficult) and that, if adjusted to settings other than the manufacturer's recommended setting, may affect emissions;

(*2*) A specification of the manufacturer's intended physically adjustable range of each such parameter, and the production tolerances of the limits or stops used to establish the physically adjustable range;

(*3*) A description of the limits or stops used to establish the manufacturer's intended physically adjustable range of each adjustable parameter, or any other means used to inhibit adjustment;

(*4*) The nominal or recommended setting, and the associated production tolerances, for each such parameter.

(B) The manufacturer may provide, in the application for certification, information relating to why certain parameters are not expected to be adjusted in actual use and to why the physical limits or stops used to establish the physically adjustable range of each parameter, or any other means used to inhibit adjustment, are effective in preventing adjustment of parameters on in-use vehicles to settings outside the manufacturer's intended physically adjustable ranges. This may include results of any tests to determine the difficulty of gaining access to an adjustment or exceeding a limit as intended or recommended by the manufacturer.

(C) The Administrator may require to be provided detailed drawings and descriptions of the various emission related components, and/or hardware samples of such components, for the purpose of making his determination of which vehicle or engine parameter will be subject to adjustment for new certification and Selective Enforcement Audit testing and of the physically adjustable range for each such vehicle or engine parameter.

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles (or engines) for which certification is requested. The sales data shall also include the altitude of intended sale for light-duty trucks.

(3) A description of the test equipment and fuel proposed to be used.

(4)(i) For light-duty vehicles and light-duty trucks, a description of the test procedures to be used to establish the evaporative emission deterioration factors required to be determined and supplied in § 86.091–23(b)(2).

(ii) For heavy-duty vehicles equipped with gasoline-fueled or methanol-fueled engines, the Administrator does not assume that each evaporative emission family-evaporative emission control system combination will deteriorate in a unique manner during the useful life of the vehicle. The manufacturer shall therefore identify those evaporative emission deterioration factors which shall be applied to the various evaporative emission family-evaporative emission control system combinations which are expected to exhibit similar deterioration characteristics during the useful life of the vehicle.

(5)(i)(A) A description of the test procedures to be used to establish the durability data or the exhaust emission deterioration factors required to be determined and supplied in § 86.091–23(b)(1).

(B) A statement of the useful life of each light-duty truck engine family or heavy-duty engine family.

(C) For engine families provided an alternative useful-life period under paragraph (f) of this section, a statement of that alternative period and a brief synopsis of the justification.

(ii) For heavy-duty diesel engine families, a statement of the primary intended service class (light, medium, or heavy) and an explanation as to why that service class was selected. Each diesel engine family shall be certified under one primary intended service class only. After reviewing the guidance in § 86.090–2, the class shall be determined on the basis of which class best represents the majority of the sales of that engine family.

(iii)(A) For each light-duty truck engine family and each heavy-duty engine family, a statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(B) A description of vehicle adjustments or modifications necessary, if any, to assure that light-duty vehicles and light-duty trucks covered by a certificate of conformity conform to the regulations while being operated at any altitude locations, and a statement of the altitude at which the adjustments or modifications apply.

(iv) At the option of the manufacturer, the proposed composition of the emission-data test fleet or (where applicable) the durability-data test fleet.

(6)(i)(A) If the manufacturer elects to participate in the particulate averaging program for diesel light-duty vehicles and/or diesel light-duty trucks or the particulate averaging program for heavy-duty diesel engines, the application must list the family particulate emission limit and the projected

U.S. production volume of the family for the model year.

(B) The manufacturer shall choose the level of the family particulate emission limits, accurate to one-hundreth of a gram per mile, or one-hundreth of a gram per brake horsepower-hour for heavy-duty engines.

(C) The manufacturer may at any time during production elect to change the level of any family particulate emission limit(s) by submitting the new limit(s) to the Administrator and by demonstrating compliance with the limit(s) as described in § 86.090-2 and § 86.091-28(b)(5)(i).

(ii)(A) If the manufacturer elects to participate in the NO_x averaging program for light-duty trucks, or the NO_x averaging program for heavy-duty engines, the application must list the family NO_x emission limit and the projected U.S. production volume of the family for the model year.

(B) The manufacturer shall choose the level of the family NO_x emission limits, accurate to one-tenth of a gram per mile, or to one-tenth of a gram per brake horsepower-hour for heavy-duty engines.

(C) The manufacturer may at any time during production elect to change the level of any family NO_x emission limit(s) by submitting the new limits to the Administrator and by demonstrating compliance with the limit(s) as described in § 86.088-2 and 86.091-28(b)(5)(ii).

(7)(i) For Otto-cycle heavy-duty engines, the application must state whether the engine family is being certified for use in all vehicles regardless of their Gross Vehicle Weight Rating (see § 86.091-10 (a)(1)(i) and (a)(3)(i)), or, only for use in vehicles with a Gross Vehicle Weight Rating greater than 14,000 pounds.

(ii) If the engine family is being certified for use in all vehicles and, is being certified to the emission standards applicable to Otto-cycle engines for use only in vehicles with a Gross Vehicle Weight Rating over 14,000 pounds under the provisions of paragraph (a)(3) of § 86.091-10, then the application must also attest that the engine family, together with all other engine families being certified under the provisions of paragraph (a)(3) of § 86.091-10, represent no more than 5 percent of model year sales of the manufacturer of all Otto-cycle heavy-duty engines for use in vehicles with Gross Vehicle Weight Ratings of up to 14,000 pounds.

(c) Complete copies of the application and of any amendments thereto, and all notifications under § 86.079-32, § 86.079-33, and § 86.082-34 shall be submitted in such multiple copies as the Administrator may require.

(d) Incomplete light-duty trucks shall have a maximum completed curb weight and maximum completed frontal area specified by the manufacturer.

(e) For vehicles equipped with gasoline-fueled or methanol-fueled heavy-duty engines, the manufacturer shall specify a maximum nominal fuel tank capacity for each evaporative emission family-evaporative emission control system combination.

(f) Light-duty truck and heavy-duty engine manufacturers who believe that the useful life periods of § 86.090-2 are significantly unrepresentative for one or more engine families (either too long or too short), may petition the Administrator to provide an alternative useful-life period. This petition must include the full rationale behind the request together with any supporting data and other evidence. Based on this or other information the Administrator may assign an alternative useful-life period. Any petition should be submitted in a timely manner, to allow adequate time for a thorough evaluation.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10655, Mar. 15, 1985, as amended at 52 FR 47867, Dec. 16, 1987; 54 FR 14469, Apr. 11, 1989]

§ 86.091-23 Required data.

(a) The manufacturer shall perform the tests required by the applicable test procedures, and submit to the Administrator the following information: *Provided, however,* That if requested by the manufacturer, the Administrator may waive any requirement of this section for testing of vehicle (or engine) for which emission data are available or will be made available under the provisions of § 86.091-29.

(b)(1)(i) Exhaust emission durability data on such light-duty vehicles tested in accordance with applicable test procedures and in such numbers as specified, which will show the performance of the systems installed on or incorporated in the vehicle for extended mileage, as well as a record of all pertinent maintenance performed on the test vehicles.

(ii) Exhaust emission deterioration factors for light-duty trucks and heavy-duty engines, and all test data that are derived from the testing described under § 86.091-21(b)(4)(iii)(A), as well as a record of all pertinent maintenance. Such testing shall be designed and conducted in accordance with good engineering practice to assure that the engines covered by a certificate issued under § 86.091-30 will meet the emission standards (or family emission limits, as appropriate) in § 86.091-9, § 86.091-10, or § 86.091-11 as appropriate, in actual use for the useful life of the engine.

(2) For light-duty vehicles and light-duty trucks, evaporative emission deterioration factors for each evaporative emission family-evaporative emission control system combination and all test data that are derived from testing described under § 86.091-21(b)(4)(i) designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.091-30 will meet the evaporative emission standards in § 86.091-8 or § 86.091-9, as appropriate, for the useful life of the vehicle.

(3) For heavy-duty vehicles equipped with gasoline-fueled or methanol-fueled engines, evaporative emission deterioration factors for each evaporative emission family-evaporative emission control system combination identified in accordance with § 86.091-21(b)(4)(ii). Furthermore, a statement that the test procedure(s) used to derive the deterioration factors includes, but need not be limited to, a consideration of the ambient effects of ozone and temperature fluctuations, and the service accumulation effects of vibration, time, and vapor saturation and purge cycling. The deterioration factor test procedure shall be designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.091-30 will meet the evaporative emission standards in § 86.091-10 and § 86.091-11 in actual use for the useful life of the engine. Furthermore, a statement that a description of the test procedure, as well as all data, analyses and evaluations, is available to the Administrator upon request.

(4)(i) For heavy-duty vehicles with a Gross Vehicle Weight Rating of up to 26,000 lbs and equipped with gasoline-fueled or methanol-fueled engines, a written statement to the Administrator certifying that the manufacturer's vehicles meet the standards of § 86.091-10 or § 86.091-11 (as applicable) as determined by the provisions of § 86.091-28. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations, and other documents, on which the above statement is based, are available to the Administrator upon request.

(ii) For heavy-duty vehicles with a Gross Vehicle Weight Rating of greater than 26,000 lbs and equipped with gasoline-fueled or methanol-fueled engines, a written statement to the Administrator certifying that the manufacturer's evaporative emission control systems are designed, using good engineering practice, to meet the standards of § 86.091-10 or § 86.091-11 (as applicable) as determined by the provisions of § 86.091-28. Furthermore, a written statement to the Administrator that all data, analyses, test procedures, evaluations, and other documents, on which the above statement is based, are available to the Administrator upon request.

(c) *Emission data.* (1) Emission data, including in the case of methanol fuel methanol, formaldehyde and organic material hydrocarbon equivalent on such vehicles tested in accordance with applicable test procedures and in such numbers as specified. These data shall include zero-mile data, if generated and emission data generated for certification as required under § 86.090-26(a)(3)(i) or § 86.090-26(a)(3)(ii). In lieu of providing emission data on idle CO emissions, smoke emissions or particulate emissions from methanol-fueled diesel certification vehicles the Administrator may, on request of the manufacturer, allow the manufacturer to demonstrate (on the basis of previous emission tests, development tests, or other information) that the engine will conform with the applicable emission standards of § 86.090-8 or § 86.090-9.

(2) Certification engines. (i) Emission data on such engines tested in accordance with applicable emission test procedures of this subpart and in such numbers as specified. These data shall include zero-hour data, if generated, and emission data generated for certification as required under § 86.090-26(c)(4). In lieu of providing emission data on idle CO emissions or particulate emissions from methanol-fueled diesel certification engines, or on CO emissions from petroleum-fueled or methanol-fueled diesel certification engines the Administrator may, on request of the manufacturer, allow the manufacturer to demonstrate (on the basis of previous emission tests, development tests, or other information) that the engine will conform with the applicable emission standards of § 86.091-11.

(d) A statement that the vehicles (or engines) for which certification is requested conform to the requirements in § 86.084-5(b), and that the descriptions of tests performed to ascertain compliance with the general standards in § 86.084-5(b), and the data derived from such tests, are available to the Administrator upon request.

(e)(1) A statement that the test vehicles (or test engines) with respect to which data are submitted to demonstrate compliance with the applicable standards (or family emission limits, as appropriate) of this subpart are in all material respects as described in the manufacturer's application for certification, have been tested in accordance with the applicable test procedures utilizing the fuels and equipment described in the application for certification and that on the basis of such tests the vehicles (or engines) conform to the requirements of this part. If such statements cannot be made with respect to any vehicle (or engine) tested, the vehicle (or engine) shall be identified, and all pertinent data relating thereto shall be supplied to the Administrator. If, on the basis of the data supplied and any additional data as required by the Administrator, the Administrator determines that the test vehicles (or test engine) was not as described in the application for certification or was not tested in accordance with the applicable test procedures utilizing the fuels and equipment as described in the application for certification, the Administrator may make the determination that the vehicle (or engine) does not meet the applicable standards (or family emission limits, as appropriate). The provisions of § 86.091-30(b) shall then be followed.

(2) For evaporative emission durability, or light-duty truck or heavy-duty engine exhaust emission durability, a statement of compliance with paragraph (b)(1)(ii), (b)(2), or (b)(3) of this section, as applicable.

(f) Additionally, manufacturers participating in any of the diesel particulate averaging programs shall submit:

(1) In the application for certification, a statement that the vehicles (or engines) for which certification is requested will not, to the best of the manufacturer's belief, when included in the manufacturer's production-weighted average emission level, cause the applicable particulate standard(s) to be exceeded.

(2) No longer than 90 days after the end of a given model year of production of engine families included in one of the diesel particulate averaging programs, the number of vehicles (or engines) produced in each engine family at each certified family diesel particulate emission limit, along with the resulting production-weighted average particulate emission level.

(g) Additionally, manufacturers participating in the light-duty truck or heavy-duty engine NO_x averaging programs shall submit:

(1) In the application for certification, a statement that the vehicles (or engines) for which certification is required will not, to the best of the manufacturer's belief, when included in the manufacturer's production-weighted average emission level, cause the

applicable NO_x standard(s) to be exceeded.

(2) No longer than 90 days after the end of a given model year of production of engine families included in one of the NO_x averaging programs, the number of vehicles (or engines) produced in each engine family at each certified family NO_x particulate emission limit, along with the resulting production-weighted average NO_x emission level.

(Information collection requirements contained in § 86.091-23 were approved by the Office of Management and Budget under control number 2060-0104)

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10659, Mar. 15, 1985, as amended at 50 FR 29384, July 19, 1985; 54 FR 14473, Apr. 11, 1989]

§ 86.091-28 Compliance with emission standards.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles.

(2) The applicable exhaust and fuel evaporative emissions standards (and family particulate emission limits, as appropriate) of this subpart apply to the emissions of vehicles for their useful life.

(3) Since it is expected that emission control efficiency will change with mileage accumulation on the vehicle, the emission level of a vehicle which has accumulated 50,000 miles will be used as the basis for determining compliance with the standards (or family particulate emission limit, as appropriate).

(4) The procedure for determining compliance of a new motor vehicle with exhaust emission standards (or family particulate emission limit, as appropriate) is as follows, except where specified by paragraph (a)(7) of this section for the Alternative Durability Program:

(i) Separate emission deterioration factors shall be determined from the exhaust emission results of the durability-data vehicle(s) for each engine-system combination. A separate factor shall be established for exhaust HC, exhaust OMHCE (methanol-fueled vehicles) exhaust CO, exhaust NO_x, and exhaust particulate (diesel vehicles) for each engine-system combination. A separate evaporative emission deterioration factor shall be determined for each evaporative emission family-evaporative emission control system combination from the testing conducted by the manufacturer (gasoline-fueled and methanol-fueled vehicles only).

(A) The applicable results to be used unless excluded by paragraph (a)(4)(i)(A)(*4*) of this section in determining the exhaust emission deterioration factors for each engine-system combination shall be:

(*1*) All valid exhaust emission data from the tests required under § 86.084-26(a)(4) except the zero-mile tests. This shall include the official test results, as determined in § 86.091-29 for all tests conducted on all durability-data vehicles of the combination selected under § 86.085-24(c) (including all vehicles elected to be operated by the manufacturer under § 86.085-24(c)(1)(ii)).

(*2*) All exhaust emission data from the tests conducted before and after the scheduled maintenance provided in § 86.088-25.

(*3*) All exhaust emission data from tests required by maintenance approved under § 86.088-25, in those cases where the Administrator conditioned his approval for the performance of such maintenance on the inclusion of such data in the deterioration factor calculation.

(*4*) The manufacturer has the option of applying an outlier test point procedure to completed durability data within its certification testing program for a given model year. The outlier procedure will be specified by the Administrator. For any pollutant, durability-data test points that are identified as outliers shall not be included in the determination of deterioration factors if the manufacturer has elected this option. The manufacturer shall specify to the Administrator before the certification of the first engine family for that model year, if it intends to use the outlier procedure. The manufacturer may not change procedures after the first engine family of the model year is certified. Where the manufacturer chooses to apply both the outlier procedure and averaging (as allowed under § 86.084-

26(a)(6)(i)) to the same data set, the outlier procedure shall be completed prior to applying the averaging procedure.

(B) All applicable exhaust emission results shall be plotted as a function of the mileage on the system, rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The data will be acceptable for use in the calculation of the deterioration factor only if the interpolated 4,000-mile and 50,000-mile points on this line are within the low-altitude standards provided in § 86.087-8. Exceptions to this where data are still acceptable are when a best fit straight line crosses an applicable standard but no data points exceeded the standard, or the best fit straight line crosses an applicable standard with a negative slope (the 4,000-mile interpolated point is higher than the 50,000-mile interpolated point) but the 50,000-mile actual data point is below the standard. An multiplicative exhaust emission deterioration factor shall be calculated for each engine-system combination as follows:

Factor=Exhaust emissions interpolated to 50,000 miles divided by exhaust emissions interpolated to 4,000 miles.

These interpolated values shall be carried out to a minimum of four places to the right of the decimal point before dividing one by the other to determine the deterioration factor. The results shall be rounded to three places to the right of the decimal point in accordance with ASTM E 29-67.

(C) An evaporative emissions deterioration factor (gasoline-fueled and methanol-fueled vehicles only) shall be determined from the testing conducted as described in § 86.090-21(b)(4)(i), for each evaporative emission family-evaporative emission control system combination to indicate the evaporative emission level at 50,000 miles relative to the evaporative emission level at 4,000 miles as follows:

Factor=Evaporative emission level at 50,000 miles minus the evaporative emission level at 4,000 miles.

The factor shall be established to a minimum of two places to the right of the decimal.

(ii)(A) The official exhaust emission test results for each emission-data vehicle at the selected test point shall be multiplied by the appropriate deterioration factor: *Provided*, that if a deterioration factor as computed in paragraph(a)(4)(i)(B) of this section is less than one, that deterioration factor shall be one for the purposes of this paragraph.

(B) The official evaporative emission test results (gasoline-fueled and methanol-fueled vehicles only) for each evaporative emission-data vehicle at the selected test point shall be adjusted by addition of the appropriate deterioration factor: *Provided*, that if a deterioration factor as computed in paragraph (a)(4)(i)(C) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(iii) The emissions to compare with the standard (or the family particulate emission limit, as appropriate) shall be the adjusted emissions of paragraphs (a)(4)(ii) (A) and (B) of this section for each emission-data vehicle. Before any emission value is compared with the standard (or the family particulate emission limit, as appropriate), it shall be rounded, in accordance with ASTM E 29-67, to two significant figures. The rounded emission values may not exceed the standard (or the family particulate emission limit, as appropriate).

(iv) Every test vehicle of an engine family must comply with the exhaust emission standards (or the family particulate emission limit, as appropriate), as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(v) Every test vehicle of an evaporative emission family must comply with the evaporative emission standard, as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(5) If a manufacturer chooses to change the level of any family particulate emission limit(s) in the particulate averaging program, compliance with the new limit(s) must be based upon existing certification data.

(6) If a manufacturer chooses to participate in the diesel particulate averaging program, the production-weighted average of the family particulate emission limits of all affected engine families must comply with the particulate standards in § 86.087-8(a)(1)(iv), or the composite particulate standard defined in § 86.085-2, as appropriate, at the end of the production year.

(7) The procedure to determine the compliance of new motor vehicles in the Alternative Durability Program (described in § 86.085-13) is the same as described in paragraphs (a)(4)(iii) through (a)(4)(v) of this section. For the engine families that are included in the Alternative Durability Program, the exhaust emission deterioration factors used to determine compliance shall be those that the Administrator has approved under § 86.085-13(c). The evaporative emission deterioration factor for each evaporative emission family shall be determined and applied according to paragraph (a)(4) of this section. The procedures to determine the minimum exhaust emissions deterioration factors required under § 86.085-13(d) are as follows:

(i) Separate deterioration factors shall be determined from the exhaust emission results of the durability-data vehicles for each engine family group. A separate factor shall be established for exhaust HC, exhaust CO, and exhaust NO_x for each engine family group. The evaporative emission deterioration factor for each evaporative family will be determined and applied in accordance with paragraph (a)(4) of this section.

(ii) The deterioration factors for each engine family group shall be determined by the Administrator using historical durability data from as many as three previous model years. These data will consist of deterioration factors generated by durability-data vehicles representing certified engine families and of deterioration factors from vehicles selected under § 86.085-24(h). The Administrator shall determine how these data will be combined for each engine family group.

(A) The test result to be used in the calculation of each deterioration factor to be combined for each engine family group shall be those test results specified in paragraph (a)(4)(i)(A) of this section.

(B) For each durability-data vehicles selected under § 86.085-24(h), all applicable exhaust emissions results shall be plotted as a function of the mileage on the system rounded to the nearest mile, and the best fit straight lines, fitted by method of least squares, shall be drawn through all these data points. The exhaust deterioration factor for each durability-data vehicles shall be calculated as specified in paragraph (a)(4)(i)(B) of this section.

(C) *Line-crossing.* For the purposes of paragraph (a)(5) of this section, line crossing occurs when either of the interpolated 4,000- and 50,000-mile points of the best fit straight line exceeds the applicable emission standard and at least one applicable data point exceeds the standard.

(*1*) The Administrator will not accept for certification line-crossing data from preproduction durability-data vehicles selected under § 86.085-24(c), § 86.085-24(h)(2), or (h)(3).

(*2*) The Administrator will not accept for certification line-crossing data from production durability-data vehicles selected under § 86.085-24(h)(1) unless the 4,000-mile test result multiplied by the engine family group deterioration factor does not exceed the applicable emission standards. The deterioration factors used for this purpose shall be those that were used in the certification of the production vehicle. Manufacturers may calculate this product immediately after the 4,000-mile test of the vehicle. If the product exceeds the applicable standards, the manufacturer may, with the approval of the Administrator, discontinue the vehicle and substitute a new vehicle. The manufacturer may continue the original vehicle, but the data will not be acceptable if line crossing occurs.

(b)(1) Paragraph (b) of this section applies to light-duty trucks.

(2) The exhaust and evaporative emission standards (and family emission limits, as appropriate) of § 86.091-9 apply to the emissions of vehicles for their useful life.

(3) Since emission control efficiency generally decreases with the accumu-

lation of mileage on the vehicle, deterioration factors will be used in combination with emission-data vehicle test results as the basis for determining compliance with the standards (or family emission limits, as appropriate).

(4)(i) Paragraph (b)(4) of this section describes the procedure for determining compliance of a new vehicle with exhaust emission standards (or family emission limits, as appropriate), based on deterioration factors supplied by the manufacturers, except where specified by paragraph (b)(5) of this section for the Alternative Durability Program.

(ii) Separate exhaust emission deterioration factors, determined from tests of vehicles, engines, subsystems, or components conducted by the manufacturer, shall be supplied for each engine-system combination. Separate factors shall be established for transient HC (OMHCE for methanol-fuel), CO, and NO_x, idle CO (vehicles equipped with Otto-cycle or methanol-fueled diesel engines only), and exhaust particulate (diesel vehicles only).

(iii) For transient HC (OMHCE for methanol-fuel), CO, and NO_x, idle CO (vehicles equipped with Otto-cycle or methanol-fueled diesel engines only), and exhaust particulate (diesel vehicles), the official exhaust emission results for each emission-data vehicle at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(iv) The emission values to compare with the standards (or family emission limits, as appropriate) shall be the adjusted emission values of paragraph (b)(4)(iii) of this section rounded to two significant figures in accordance with ASTM E 29-67 for each emission-data engine.

(5)(i) Paragraph (b)(5)(i) of this section applies only to manufacturers electing to participate in the particulate averaging program.

(A) If a manufacturer chooses to change the level of any family particulate emission limit(s), compliance with the new limit(s) must be based upon existing certification data.

(B) The production-weighted average of the family particulate emission limits of all applicable engine families, rounded to two significant figures in accordance with ASTM E 29-67, must comply with the particulate standards in § 86.088-9 (a)(1)(iv) or (d)(1)(iv), or the composite particulate standard as defined in § 86.085-2, as appropriate, at the end of the product year.

(ii) Paragraph (b)(5)(ii) of this section applies only to manufacturers electing to participate in the NO_x averaging program.

(A) If a manufacturer chooses to change the level of any family NO_x emission limit(s), compliance with the new limit(s) must be based upon existing certification data.

(B) The production-weighted average of the family NO_x emission limits of all applicable engine families, rounded to two significant figures in accordance with ASTM E 29-67, must comply with the NO_x emission standards of § 86.088-9(a)(1)(iii) (A) or (B), or of § 86.088-9(d)(1)(iii) (A) or (B), or the composite NO_x standard as defined in § 86.088-2, at the end of the product year.

(6) The procedure to determine the compliance of new motor vehicles in the Alternative Durability Program (described in § 86.085-13) is the same as described in paragraph (b)(4)(iv), (b)(7)(iv) and (b)(8) of this section. For the engine families that are included in the Alternative Durability Program, the exhause emission deterioration factors used to determine compliance shall be those that the Administrator has approved under § 86.085-13(c). The evaporative emission deterioration factor for each evaporative emission family shall be determined and applied according to paragraph (b)(7) of this section. The procedures to determine the minimum exhaust emissions deterioration factors required under § 86.085-13(d) are as follows:

(i) Separate deterioration factors shall be determined from the exhaust emission results of the durability-data vehicles for each engine family group. A separate factor shall be established for exhaust HC, exhaust CO, and exhaust NO_x for each engine family group. The evaporative emission deterioration factor for each evaporative family will be determined and applied in accordance with paragraph (b)(6) of this section.

(ii) The deterioration factors for each engine family group shall be determined by the Administrator using historical durability data from as many as three previous model years. These data will consist of deterioration factors generated by durability-data vehicles representing certified engine families and of deterioration factors from vehicles selected under § 86.085–24(h). The Administrator shall determine how these data will be combined for each engine family group.

(A) The test results to be used in the calculations of each deterioration factor to be combined for each engine family group shall be those test results specified in paragraph (a)(4)(i)(A) of this section.

(B) For each durability-data vehicle selected under § 86.085–24(h), all applicable exhaust emission results shall be plotted as a function of the mileage on the system rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The exhaust deterioration factor for each durability-data vehicle shall be calculated as specified in paragraph (a)(4)(i)(B) of this section.

(C) *Line crossing.* For the purposes of paragraph (b)(5) of this section, line crossing occurs when either of the interpolated 4,000- and 120,000-mile points of the best fit straight line exceeds the applicable emission standard and at least one applicable data point exceeds the standard.

(*1*) The Administrator will not accept for certification line-crossing data from preproduction durability-data vehicles selected under § 86.085–24(c)(1), or § 86.085–24 (h)(2) or (h)(3).

(*2*) The Administrator will not accept for certification line-crossing data from production durability-data vehicles selected under § 86.085–24(h)(1) unless the 4,000-mile test result multiplied by the engine family group deterioration factor does not exceed the applicable emission standard. The deterioration factors used for this purpose shall be those that were used in the certification of the production vehicle. Manufacturers may calculate this product immediately after the 4,000-mile test of the vehicle. If the product exceeds the applicable standard, the manufacturer may, with the approval of the Administrator, discontinue the vehicle and substitute a new vehicle. The manufacturer may continue the original vehicle, but the data will not be acceptable if line crossing occurs.

(7)(i) Paragraph (b)(7) of this section describes the procedure for determining compliance of a new vehicle with fuel evaporative emission standards. The procedure described here shall be used for all vehicles in all model years.

(ii) The manufacturer shall determine, based on testing described in § 86.091–21(b)(4)(i), and supply an evaporative emission deterioration factor for each evaporative emission family-evaporative emission control system combination. The factor shall be calculated by subtracting the emission level at the selected test point from the emission level at the useful life point.

(iii) The official evaporative emission test results for each evaporative emission-data vehicle at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission value to compare with the standards shall be the adjusted emission value of paragraph (b)(7)(iii) of this section rounded to two significant figures in accordance with ASTM E 29–67 for each evaporative emission-data vehicle.

(8) Every test vehicle of an engine family must comply with all applicable standards (and family emission limits, as appropriate), as determined in paragraphs (b)(4)(iv) and (b)(7)(iv) of this section, before any vehicle in that family will be certified.

(c)(1) Paragraph (c) of this section applies to heavy-duty engines.

(2) The exhaust emission standards (or family emission limits, as appropri-

ate) for Otto-cycle engines in § 86.090-10 or for diesel engines in § 86.091-11 apply to the emissions of engines for their useful life.

(3) Since emission control efficiency generally decreases with the accumulation of service on the engine, deterioration factors will be used in combination with emission-data engine test results as the basis for determining compliance with the standards.

(4)(i) Paragraph (c)(4) of this section describes the procedure for determining compliance of an engine with emission standards (or family emission limits, as appropriate), based on deterioration factors supplied by the manufacturer.

(ii) Separate exhaust emission deterioration factors, determined from tests of engines, subsystems, or components conducted by the manufacturer, shall be supplied for each engine-system combination. For Otto-cycle engines, separate factors shall be established for transient HC (OMHCE), CO, and NO_x; and idle CO, for those engines utilizing aftertreatment technology (*e.g.*, catalytic converters). For diesel engines, separate factors shall be established for transient HC (OMHCE), CO, NO_x, and exhaust particulate. For diesel smoke testing, separate factors shall also be established for the acceleration mode (designated as "A"), the lugging mode (designated as "B"), and peak opacity (designated as "C").

(iii)(A) Paragraph (c)(4)(iii)(A) of this section applies to Otto-cycle heavy-duty engines.

(*1*) *Otto-cycle heavy-duty engines not utilizing aftertreatment technology (e.g., catalytic converters).* For transient HC (OMHCE), CO, and NO_x, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(*2*) *Otto-cycle heavy-duty engines utilizing aftertreatment technology (e.g., catalytic converters).* For transient HC (OMHCE), CO, and NO_x, and for idle CO, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(B) Paragraph (c)(4)(iii)(B) of this section applies to diesel heavy-duty engines.

(*1*) *Diesel heavy-duty engines not utilizing aftertreatment technology (e.g., particulate traps).* For transient HC (OMHCE), CO, NO_x, and exhaust particulate, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(*2*) *Diesel heavy-duty engines utilizing aftertreatment technology (e.g., particulate traps).* For transient HC (OMHCE), CO, NO_x, and exhaust particulate, the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(*3*) *Diesel heavy-duty engines only.* For acceleration smoke ("A"), lugging smoke ("B"), and peak smoke ("C"), the official exhaust emission results for each emission-data engine at the selected test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission values to compare with the standards (or family emission limits, as appropriate) shall be the adjusted emission values of paragraph (c)(4)(iii) of this section, rounded to the same number of significant figures as contained in the applicable standard in accordance with ASTM E 29-67, for each emission-data engine.

(5)—(6) [Reserved]

(7) Every test engine of an engine family must comply with all applicable standards (or family emission limits, as appropriate), as determined in paragraph (c)(4)(iv) of this section, before any engine in that family will be certified.

(d)(1) Paragraph (d) of this section applies to heavy-duty vehicles equipped with gasoline-fueled or methanol-fueled engines.

(2) The applicable evaporative emission standard in § 86.091-10 or § 86.091-11 applies to the emissions of vehicles for their useful life.

(3)(i) For vehicles with a GVWR of up to 26,000 pounds, because it is expected that emission control efficiency will change during the useful life of the vehicle, an evaporative emission deterioration factor shall be determined from the testing described in § 86.088-23(b)(3) for each evaporative emission family-evaporative emission control system combination to indicate the evaporative emission control system deterioration during the useful life of the vehicle (minimum 50,000 miles). The factor shall be established to a minimum of two places to the right of the decimal.

(ii) For vehicles with a GVWR of greater than 26,000 pounds, becaue it is expected that emission control efficiency will change during the useful life of the vehicle, each manufacturer's statement as required in § 86.088-23(b)(4)(ii) shall include, in accordance with good engineering practice, consideration of control system deterioration.

(4) The evaporative emission test results, if any, shall be adjusted by the addition of the appropriate deterioration factor: *Provided*, That if the deterioration factor as computed in paragraph (d)(3) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(5) The emission level to compare with the standard shall be the adjusted emission level of paragraph (d)(4) of this section. Before any emission value is compared with the standard, it shall be rounded, in accordance with ASTM E 29-67, to two significant figures. The rounded emission values may not exceed the standard.

(6) Every test vehicle of an evaporative emission family must comply with the evaporative emission standard, as determined in paragraph (d)(5) of this section, before any vehicle in that family may be certified.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10669, Mar. 15, 1985, as amended at 51 FR 24609, July 7, 1986; 54 FR 14484, Apr. 11, 1989]

§ 86.091-29 Testing by the Administrator.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(2) The Administrator may require that any one or more of the test vehicles be submitted to him, at such place or places as he may designate, for the purposes of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test vehicle, the results of that test shall, unless subsequently invalidated by the Administrator, comprise the official data for the vehicle at the prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards (or family emission limits, as appropriate).

(ii) Whenever the Administrator does not conduct a test on a test vehicle at a test point, the manufacturer's test data will be accepted as the official data for that point: *Provided*, That if the Administrator makes a determination based on testing under paragraph (a)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *And further provided,* That if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provisions of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission or further information. If the manufacturer conducts more than one test on a vehicle, as authorized under § 86.084-26 (a)(3)(i)(A) or (b)(4)(i)(A), the data from the last test in that series of tests on that vehicle, will constitute the official data.

(iii)(A)(*1*) The Administrator may adjust or cause to be adjusted any adjustable parameter of an emission-data vehicle or engine which the Administrator has determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.085-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.085-22(e)(3)(i), prior to the performance of any tests to determine whether such vehicle or engine conforms to applicable emission standards, including tests performed by the manufacturer under § 86.091-23(c)(1). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before it accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. The Administrator, in making or specifying such adjustments, will consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use light-duty vehicles or light-duty trucks. In determining likelihood, the Administrator will consider factors such as, but not limited to, the effect of the adjustment on vehicle performance characteristics and surveillance information from similar in-use vehicles.

(*2*) For those vehicles or engine parameters which the Administrator has not determined to be subject to adjustment during certification and Selective Enforcement Audit testing in accordance with § 86.085-22(e)(1), the emission-data vehicle presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the vehicle label (see § 86.091-35 (a)(1)(iii)(D) or (a)(2)(iii)(D)) as specified in the application for certification. If the Administrator determines that a vehicle is not within such tolerances, the vehicle will be adjusted, at the facility designated by the Administrator, prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the vehicle will be used as an emission-data vehicle.

(B) If the Administrator determines that the test data developed on an emission-data vehicle under paragraph (a)(3)(i) of this section would cause that vehicle to fail due to excessive 4,000-mile emissions or by application of the appropriate deterioration factor, then the following procedure shall be observed:

(*1*) The manufacturer may request a retest. Before the retest, those vehicle or engine parameters which the Administrator has not determined to be subject to adjustment for certification and Selective Enforcement Audit testing in accordance with § 86.085-22(e)(1) may be readjusted to manufacturer's specification, if these adjustments were made incorrectly prior to the first test. The Administrator may adjust or cause to be adjusted any parameter which the Administrator has determined to be subject to adjustment to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.085-22(e)(3)(i). Other maintenance or repairs may be performed in accordance with § 86.088-25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The vehicle will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data vehicle.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (a)(2) of this section to enable the Administrator to determine whether an emission-data vehicle would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (a)(3)(iii)(A) and (B) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the vehicle from the test premises.

(b)(1) Paragraph (b) of this section applies to heavy-duty engines.

(2) The Administrator may require that any one or more of the test engines be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test engine the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the engine at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards (or family emission limits, as appropriate).

(ii) Whenever the Administrator does not conduct a test on a test engine at a test point, the manufacturer's test data will be accepted as the official data for that test point: *Provided*, That if the Administrator makes a determination based on testing under paragraph (b)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *And further provided*, That if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission of further information.

(iii)(A)(*1*) The Administrator may adjust or cause to be adjusted any adjustable parameter of an emission-data engine which the Administrator has determined to be subject to adjustment for certification testing in accordance with § 86.085-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.085-22(e)(3)(i), prior to the performance of any tests to determine whether such engine conforms to applicable emission standards, including tests performed by the manufacturer under § 86.088-23(c)(2). The Administrator, in making or specifying such adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use heavy-duty engines. In determining likelihood, the Administrator may consider factors such as, but not limited to, the effect of the adjustment on engine performance characteristics and surveillance information from similar in-use engines.

(*2*) For those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.085-22(e)(1), the emission-data engine presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the engine label (see § 86.091-35(a)(3)(iii)) as specified in the application for certification. If the Administrator determines that an engine is not within such tolerances, the engine shall be adjusted at the facility designated by the Administrator prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the engine shall be used as an emission-data engine.

(B) If the Administrator determines that the test data developed under paragraph (b)(3)(iii)(A) of this section would cause the emission-data engine to fail due to excessive 125-hour emission values or by the application of the appropriate deterioration factor, then the following procedure shall be observed:

(*1*) The manufacturer may request a retest. Before the retest, those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.085-22(e)(1) may be readjusted to the manufacturer's specifications, if these adjustments were made incorrectly prior to the first test. The Administrator may adjust or cause to be adjusted any parameter which the Administrator has determined to be subject to adjustment in accordance with § 86.085-22(e)(3)(i). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before it accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. Other maintenance or repairs may be performed in accordance with § 86.088-25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The engine will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data engine.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (b)(2) of this section to enable the Administrator to determine whether an emission-data engine would fail, the manufacturer may request a retest in accordance with the provisions of paragraph (b)(3)(iii)(B) (1) and (2) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the engine from the test premises.

(c)(1) Paragraph (c) of this section applies to gasoline-fueled and methanol-fueled heavy-duty vehicles.

(2) The Administrator may require that any one or more of the evaporative emission family-system combinations included in the manufacturer's statement(s) of compliance be installed on an appropriate vehicle and such vehicle be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on an evaporative emission family-system combination the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the evaporative emission family-system combination and the manufacturer's data, analyses, etc., shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on an evaporative emission family-system combination, the manufacturer's test data will be accepted as the official data: *Provided*, That if the Administrator makes a determination, based on testing under paragraph (c)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *And further provided*, That if the Administrator has reasonable basis to believe that any test data, analyses, or other information submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept those data, analyses, etc., as the official data pending retesting or submission of further information.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10675, Mar. 15, 1985, as amended at 54 FR 14488, Apr. 11, 1989]

§ 86.091-30 Certification.

(a)(1)(i) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 86.078-7(c), and any other pertinent data or information, the Administrator determines that a test vehicle(s) (or test engine(s)) meet(s) the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such vehicles(s) (or engine(s)) except in cases covered by paragraphs (a)(1)(ii) and (c) of this section.

(ii) *Gasoline-fueled and methanol-fueled heavy-duty vehicles.* If, after a review of the statement(s) of compliance submitted by the manufacturer under § 86.091-23(b)(4) and any other pertinent data or information, the Administrator determines that the requirements of the Act and this subpart have been met, he will issue one certificate of conformity per manufacturer with respect to the evaporative emission family(s) covered by such statement(s) except in cases covered by paragraph (c) of this section.

(2) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary or appropriate to assure that any new motor vehicle (or new motor vehicle engine) covered by the certificate will meet the requirements of the Act and of this part.

(3)(i) One such certificate will be issued for each engine family. For gasoline-fueled and methanol fueled light-duty vehicles and light-duty trucks, one such certificate will be issued for each engine family evaporative emission family combination.

(A) *Light-duty vehicles.* Each certificate will certify compliance with no more than one set of standards (or family emission limits, as appropriate).

(B) *Light-duty trucks.* Each certificate will certify compliance with no more than one set of standards (or family emission limits, as appropriate), except for low-altitude standards and high altitude standards. The certificate shall state that it covers vehicles sold or delivered to an ultimate purchaser for principal use at a designated high-altitude location only if the vehicle conforms in all material respects to the design specifications that apply to those vehicles described in the application for certification at high altitude.

(ii) For gasoline-fueled and methanol fueled heavy- duty vehicles, one such certificate will be issued for each manufacturer and will certify compliance for those vehicles previously identified in that manufacturer's statement(s) of compliance as required in § 86.091-23(b)(4) (i) and (ii).

(iii) For diesel light-duty vehicles and light-duty trucks, or diesel heavy-duty engines, included in the applicable particulate averaging program, the manufacturer may at any time during production elect to change the level of any family particulate emission limit by demonstrating compliance with the new limit as described in §§ 86.091-28(a)(6) and 86.091-28(b)(5)(i). New certificates issued under this paragraph will be applicable only for vehicles (or engines) produced subsequent to the date of issuance.

(iv) For light-duty trucks or heavy-duty engines included in the applicable NO_x averaging program, the manufacturer may at any time during production elect to change the level of any family NO_x emission limit by demonstrating compliance with the new limit as described in § 86.091-28(b)(5)(ii). New certificates issued under this paragraph will be applicable only for vehicles (or engines) produced subsequent to the day of issue.

(4)(i) The adjustment or modification of any light-duty truck in accordance with instructions provided by the manufacturer for the altitude where the vehicle is principally used will not be considered a violation of section 203(a)(3) of the Clean Air Act.

(ii) A violation of section 203(a)(1) of the Clean Air Act occurs when a manufacturer sells or delivers to an ultimate purchaser any light-duty vehicle or light-duty truck, subject to the regulations under the Act, under any of the conditions specified in the remainder of this paragraph.

(A) When a light-duty vehicle or light-duty truck is not configured to meet high-altitude requirements:

(*1*) At a designated high-altitude location, unless such manufacturer has reason to believe that such vehicle will not be sold to an ultimate purchaser for principal use at a designated high-altitude location; or

(*2*) At a location other than a designated high-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated high-altitude location.

(B) When a light-duty vehicle is not configured to meet low-altitude requirements, as provided in § 86.087-8(i):

(*1*) At a designated low-altitude location, unless such manufacturer has reason to believe that such vehicle will not be sold to an ultimate purchaser for principal use at a designated low-altitude location; or

(*2*) At a location other than a designated low-altitude location, when such manufacturer has reason to believe that such motor vehicle will be sold to an ultimate purchaser for principal use at a designated low-altitude location.

(iii) A manufacturer shall be deemed to have reason to believe that a light-duty vehicle that has been exempted from compliance with emission standards at high-altitude, or a light-duty truck which is not configured to meet high-altitude requirements, will not be sold to an ultimate purchaser for principal use at a designated high-altitude location if the manufacturer has informed its dealers and field representatives about the terms of these high-altitude regulations, has not caused the improper sale itself, and has taken reasonable action which shall include, but not be limited to, either paragraph (a)(4)(iii)(A) or (B), and (a)(4)(ii)(C) of this section:

(A) Requiring dealers in designated high-altitude locations to submit written statements to the manufacturer signed by the ultimate purchaser that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location; requiring dealers in counties contiguous to designated high-altitude locations to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location; and for each sale or delivery of fleets of ten or more such vehicles in a high-altitude location or in counties contiguous to high-altitude locations, requiring either the selling dealer or the delivering dealer to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated high-altitude location, that a vehicle which is not configured to meet high-altitude requirements will not be used principally at a designated high-altitude location. In addition, the manufacturer will make available to EPA, upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold), sales, warranty, or other information pertaining to sales of vehicles by the dealers described above maintained by the manufacturer in the normal course of business relating to the altitude configuration of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of low-altitude vehicles by high-altitude dealers, or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser for principal use at a designated high-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a State or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the high-altitude requirements to an ultimate purchaser residing in a designated high-altitude location, or based on information obtained pursuant to paragraph (a)(4)(iii) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and, where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet high-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(iv) A manufacturer shall be deemed to have reason to believe that a light-duty vehicle which has been exempted from compliance with emission standards at low-altitude, as provided in § 86.087-8(i), will not be sold to an ultimate purchaser for principal use at a designated low-altitude location if the manufacturer has informed its dealers and field representatives about the terms of the high-altitude regulations, has not caused the improper sale itself, and has taken reasonable action which shall include, but not be limited to, either paragraph (a)(4)(iv) (A) or (B), and (a)(4)(iv)(C) of this section:

(A) Requiring dealers in designated low-altitude locations to submit written statements to the manufacturer signed by the ultimate purchaser that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated low-altitude location; requiring dealers in counties contiguous to designated low-altitude locations to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated low-altitude location, that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated low-altitude location; and for each sale or delivery of fleets of ten or more such vehicles in a low-altitude location or in counties contiguous to low-altitude locations, requiring either the selling dealer or the delivering dealer to submit written statements to the manufacturer, signed by the ultimate purchaser who represents to the dealer in the normal course of business that he or she resides in a designated low-altitude location, that a vehicle which is not configured to meet low-altitude requirements will not be used principally at a designated high-altitude location. In addition, the manufacturer will make available to EPA, upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold), sales, warranty or other information pertaining to sales of vehicles by the dealers described above maintained by the manufacturer in the normal course of business relating to the altitude configuration of vehicles and the locations of ultimate purchasers; or

(B) Implementing a system which monitors factory orders of high-altitude vehicles by low-altitude dealers or through other means, identifies dealers that may have sold or delivered a vehicle not configured to meet the low-altitude requirements to an ultimate purchaser for principal use at a designated low-altitude location; and making such information available to EPA upon reasonable written request (but not more frequently than quarterly, unless EPA has demonstrated that it has substantial reason to believe that an improperly configured vehicle has been sold); and

(C) Within a reasonable time after receiving written notice from EPA or a state or local government agency that a dealer may have improperly sold or delivered a vehicle not configured to meet the low-altitude requirements to an ultimate purchaser residing in a designated low-altitude location, or based on information obtained pursuant to paragraph (a)(4)(iv) of this section that a dealer may have improperly sold or delivered a significant number of such vehicles to ultimate purchasers so residing, reminding the dealer in writing of the requirements of these regulations, and, where appropriate, warning the dealer that sale by the dealer of vehicles not configured to meet low-altitude requirements may be contrary to the terms of its franchise agreement with the manufacturer and the dealer certification requirements of § 85.2108 of this chapter.

(5)(i) For the purpose of paragraph (a) of this section, a "designated high-altitude location" is any county which has substantially all of its area located above 1,219 meters (4,000 feet) and:

(A) Requested and extension past the attainment date of December 31, 1982, for compliance with either the National Ambient Air Quality Standards for carbon monoxide or ozone, as indicated in Part 52 (Approval and Promulgation of Implementation Plans) of this title; or

(B) Is in the same state as a county designated as a high-altitude location according to paragraph (a)(5)(i)(A) of this section.

(ii) The designated high-altitude locations defined in paragraph (a)(5)(i) of this section are listed below:

STATE OF COLORADO

Adams
Alamosa
Arapahoe
Archuleta
Boulder
Chaffee
Cheyenne
Clear Creek
Conejos
Costilla
Crowley
Custer
Delta
Denver
Dolores
Douglas
Eagle
Elbert
El Paso
Fremont
Garfield
Gilpin
Grand
Gunnison
Hinsdale
Huerfano
Jackson
Jefferson
Kit Carson
Lake
La Plata
Larimer
Las Animas
Lincoln
Mesa
Mineral
Moffat
Montezuma
Montrose
Morgan
Otero
Ouray
Park
Pitkin
Pueblo
Rio Blanco
Rio Grande
Routt
Saguache
San Juan
San Miguel
Summit
Teller
Washington
Weld

STATE OF NEVADA

Carson City
Douglas
Elko
Esmeralda
Eureka
Humboldt
Lander
Lincoln
Lyon
Mineral
Nye
Pershing
Storey
Washoe
White Pine

STATE OF NEW MEXICO

Bernalillo
Catron
Colfax
Curry
De Baca
Grant
Guadalupe
Harding
Hidalgo
Lincoln
Los Alamos
Luna
McKinley
Mora
Otero
Rio Arriba
Roosevelt
Sandoval
San Juan
San Miguel
Santa Fe
Sierra
Socorro
Taos
Torrance
Union
Valencia

STATE OF UTAH

Beaver
Box Elder
Cache
Carbon
Daggett
Davis
Duchesne
Emery
Garfield
Grand
Iron
Juab
Kane
Millard
Morgan
Piute
Rich
Salt Lake
San Juan
Sanpete
Sevier
Summit
Tooele
Uintah
Utah
Wasatch
Wayne
Weber

(iii) For the purpose of paragraph (a) of this section, a "designated low-altitude location" is any county which has substantially all of its area located below 1,219 meters (4,000 feet).

(iv) The designated low-altitude locations so defined include all counties in the United States which are not listed in eithir paragraph (a)(5)(ii) of this section or in the list below:

State of Arizona

Apache
Cochise
Coconino
Navajo
Yavapai

State of Idaho

Bannock
Bear Lake
Bingham
Blaine
Bonneville
Butte
Camas
Caribou
Cassia
Clark
Custer
Franklin
Fremont
Jefferson
Lemhi
Madison
Minidoka
Oneida
Power
Treton
Valley

State of Montana

Beaverhead
Deer Lodge
Gallatin
Jefferson
Judith Basin
Madison
Meagher
Park
Powell
Silver Bow
Wheatland

State of Nebraska

Banner
Cheyenne
Kimball
Sioux

State of Oregon

Harney
Klamath
Lake

State of Texas

Jeff Davis
Hudspeth
Parmer

State of Wyoming

Albany
Campbell
Carbon
Converse
Fremont
Goshen
Hot Springs
Johnson
Laramie
Lincoln
Natrona
Niobrara
Park
Platte
Sublette
Sweetwater
Teton
Uinta
Washakie
Weston

(6) Catalyst-equipped vehicles, otherwise covered by a certificate, which are driven outside the United States, Canada, and Mexico will be presumed to have been operated on leaded gasoline resulting in deactivation of the catalysts. If these vehicles are imported or offered for importation without retrofit of the catalyst, they will be considered not to be within the coverage of the certificate unless included in a catalyst control program operated by a manufacturer or a United States Government agency and approved by the Administrator.

(7) For incomplete light-duty trucks, a certificate covers only those new motor vehicles which, when completed by having the primary load-carrying device or container attached, conform to the maximum curb weight and frontal area limitations described in the application for certification as required in § 86.091–21(d).

(8) For heavy-duty engines, a certificate covers only those new motor vehicle engines installed in heavy-duty vehicles which conform to the minimum gross vehicle weight rating, curb weight, or frontal area limitations for heavy-duty vehicles described in § 86.082–2.

(9) For incomplete gasoline-fueled and methanol-fueled heavy-duty vehicles a certificate covers only those new motor vehicles which, when completed, conform to the nominal maximum fuel tank capacity limitations as described in the application for certification as required in § 86.091–21(e).

(10) For diesel light-duty vehicle and diesel light-duty truck families, or diesel heavy-duty engine familes which are included in a particulate averaging program, the manufacturer's production-weighted average of the particulate emission limits of all engine families in a participating class or classes shall not exceed the applicable diesel particulate standard, or the composite particulate standard defined in § 86.085–2, as appropriate, at the end of the model year, as determined in accordance with 40 CFR Part 86. The certificate shall be void *ab initio* for those vehicles causing any exceedance of the particulate standard.

(11) For light-duty truck families, or heavy-duty engine families, which are included in a NO_x averaging program, the manufacturer's production-weighted average of the NO_x emission limits of all such engine families shall not exceed the applicable NO_x emission standard, or the composite NO_x emis-

sion standard defined in § 86.088-2, as appropriate, at the end of the model year, as determined in accordance with 40 CFR Part 86. The certificate shall be void *ab initio* for those vehicles causing any exceedance of the NO_x standard.

(b)(1) The Administrator will determine whether a vehicle (or engine) covered by the application complies with applicable standards (or family emission limits, as appropriate) by observing the following relationships:

(i) *Light-duty vehicles.* (A) The durability data vehicle(s) selected under § 86.090-24(c)(1)(i) shall represent all vehicles of the same engine system combination.

(B) The emission data vehicle(s) selected under § 86.090-24(b)(1) (ii) through (iv) shall represent all vehicles of the same engine-system combination as applicable.

(C) The emission-data vehicle(s) selected under § 86.090-24(b)(1)(vii) (A) and (B) shall represent all vehicles of the same evaporative control system within the evaporative family.

(ii) *Light-duty trucks.* (A) The emission-data vehicle(s) selected under § 86.090-24(b)(1)(ii), shall represent all vehicles of the same engine-system combination as applicable.

(B) The emission-data vehicle(s) selected under § 86.090-24(b)(1)(vii) (A) and (B) shall represent all vehicles of the same evaporative control system within the evaporative family.

(C) The emission-data vehicle(s) selected under § 86.090-24(b)(1)(v) shall represent all vehicles of the same engine-system combination as applicable.

(D) The emission-data vehicle(s) selected under § 86.090-24(b)(1)(viii) shall represent all vehicles of the same evaporative control system within the evaporative emission family, as applicable.

(iii) *Heavy-duty engines.* (A) An Otto-cycle emission-data test engine selected under § 86.090-24(b)(2)(iv) shall represent all engines in the same family of the same engine displacement-exhaust emission control system combination.

(B) An Otto-cycle emission-data test engine selected under § 86.090-24(b)(2)(iii) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(C) A diesel emission data test engine selected under § 86.090-24(b)(3)(ii) shall represent all engines in the same engine-system combination.

(D) A diesel emission-data test engine selected under § 86.090-24(b)(3)(iii) shall represent all engines of that emission control system at the rated fuel delivery of the test engine.

(iv) *Gasoline-fueled and methanol-fueled heavy-duty vehicles.* A statement of compliance submitted under § 86.091-23(b)(4) (i) or (ii) shall represent all vehicles in the same evaporative emission family-evaporative emission control system combination.

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the vehicles (or engines) belonging to an engine family or engine family-evaporative emission family combination (as applicable), all of which comply with all applicable standards (or family emission limits, as appropriate).

(3) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to § 86.091-29, data or information derived from any inspection carried out under § 86.078-7(c) or any other pertinent data or information, the Administrator determines that one or more test vehicles (or test engines) of the certification test fleet do not meet applicable standards (or family emission limits, as appropriate), he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determination and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in ac-

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cordance with § 86.078-6 with respect to such issue.

(4) For light-duty vehicles and light-duty trucks the manufacturer may, at its option, proceed with any of the following alternatives with respect to an emission-data vehicle determined not in compliance with all applicable standards (or family emission limits, as appropriate) for which it was tested:

(i) Request a hearing under § 86.078-6; or

(ii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed, from his application;

(A) If the failed vehicle was tested for compliance with exhaust emission standards (or family emission limits, as appropriate) only: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle to be tested for exhaust emission compliance only.

(B) If the failed vehicle was tested for compliance with both exhaust and evaporative emission standards: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle which will be tested for compliance with both exhaust and evaporative emission standards. If one vehicle cannot be selected in accordance with the selection criteria employed in selecting the failed vehicle, then two vehicles may be selected (*i.e.*, one vehicle to satisfy the exhaust emission vehicle selection criteria and one vehicle to satisfy the evaporative emission vehicle selection criteria). The vehicle selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards (or family emission limits, as appropriate) only. The vehicle selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards; or

(iii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed from the application and add a vehicle configuration(s) (or evaporative vehicle configuration(s), as applicable) not previously listed. The Administrator may require, if applicable, that the failed vehicle be modified to the new engine code (or evaporative emission code, as applicable) and demonstrate by testing that it meets applicable standards (or family emission limits, as appropriate) for which it was originally tested. In addition, the Administrator may select, in accordance with the vehicle selection criteria given in § 86.090-24(b), a new emission-data vehicle or vehicles. The vehicles selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards (or family emission limits, as appropriate) only. The vehicles selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards (or family emission limits, as appropriate); or

(iv) Correct a component or system malfunction and show that with a correctly functioning system or component the failed vehicle meets applicable standards (or family emission limits, as appropriate) for which it was originally tested. The Administrator may require a new emission-data vehicle, of identical vehicle configuration (or evaporative vehicle configuration, as applicable) to the failed vehicle, to be operated and tested for compliance with the applicable standards (or family emission limits, as appropriate) for which the failed vehicle was originally tested.

(5) For heavy-duty engines the manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test engine(s) determined not in complinace with applicable standards (or family emission limit, as appropriate):

(i) Request a hearing under § 86.078-6; or

(ii) Delete from the application for certification the engines represented by the failing test engine. (Engines so deleted may be included in a later request for certification under § 86.079-32.) The Administrator may then select in place of each failing engine an alternate engine chosen in accordance with selection criteria employed in selecting the engine that failed; or

(iii) Modify the test engine and demonstrate by testing that it meets applicable standards. Another engine which is in all material respect the same as the first engine, as modified, may then be operated and tested in accordance with applicable test procedures.

(6) If the manufacturer does not request a hearing or present the required data under paragraphs (b)(4) or (b)(5) of this section (as applicable) of this section, the Administrator will deny certification.

(c) (1) Notwithstanding the fact that any certification vehicle(s) (or certification engine(s)) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such vehicle(s) (or engine(s)) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof;

(ii) The manufacturer renders inaccurate any test data which he submits pertaining thereto or otherwise circumvents the intent of the Act, or of this part with respect to such vehicle (or engine);

(iii) Any EPA Enforcement Officer is denied access on the terms specified in § 86.078-7(c) to any facility or portion thereof which contains any of the following:

(A) The vehicle (or engine);

(B) Any components used or considered for use in its modification or buildup into a certification vehicle (or certification engine);

(C) Any production vehicle (or production engine) which is or will be claimed by the manufacturer to be covered by the certificate;

(D) Any step in the construction of a vehicle (or engine) described in paragraph (c)(iii)(C) of this section;

(E) Any records, documents, reports, or histories required by this part to be kept concerning any of the above;

(iv) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 86.078-7(c)) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(2) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraphs (c)(1)(i),(ii),(iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void *ab initio*.

(4) In any case in which certification of a vehicle (or engine) is proposed to be withheld, denied, revoked, or suspended under paragraph (c)(1)(iii) or (iv) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.078-7(c) in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle (or engine) in question was not involved in the violation to a degree that would warrant withholding, denial, revocation, or suspension of certification under either paragraph (c)(1)(iii) or (iv) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(5) Any revocation or suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.078-6 hereof.

(ii) Extend no further than to forbid the introduction into commerce of vehicles (or engines) previously covered by the certification which are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes the certification invalid *ab initio*.

(6) The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Administrator under paragraph (c)(1) of this section to withhold or deny certi-

fication be reviewed in a hearing conducted in accordance with § 86.078-6. If the Administrator finds, after a review of the request and supporting data, that the request raises a substantial factual issue, he will grant the request with respect to such issue.

(d)(1) *For light-duty vehicles.* Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.603; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.603; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.609; or

(iv) The manufacturer renders inaccurate any test data which he submits pursuant to § 86.609; or

(v) Any EPA Enforcement Officer is denied the opportunity to conduct activities related to entry and access as authorized in § 86.606 of this part and in a warrant or court order presented to the manufacturer or the party in charge of a facility in question; or

(vi) EPA Enforcement Officers are unable to conduct activities related to entry and access or to obtain "reasonable assistance" as authorized in § 86.606 of this part because a manufacturer has located its facility in a foreign jurisdiction where local law prohibits those activities; or

(vii) The manufacturer refuses to or in fact does not comply with §§ 86.604(a), 86.605, 86.607, 86.608, or 86.610.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraph (d)(1)(i), (ii), or (vii) of this section where the refusal is caused by conditions and circumstances outside the control of the manufacturer which render it impossible to comply with those requirements.

(3) The sanction of suspending a certificate may be imposed for the reasons in paragraph (d)(1)(iii), (iv), or (v) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a vehicle is proposed to be suspended under paragraph (d)(1)(v) of this section and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.606 in fact occurred, if the manufacturer wishes to contend that, although the violation occurred, the vehicle configuration or engine family in question was not involved in the violation to a degree that would warrant suspension of certification under paragraph (d)(1)(v) of this section, the manufacturer shall have the burden of establishing the contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (d)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.614; and

(ii) Not apply to vehicles no longer in the hands of the manufacturer.

(7) Any voiding of a certificate of conformity under paragraph (d)(4) of this section will be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.614.

(e) *For light-duty trucks and heavy duty engines.* (1) Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle or engine configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.1003; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.1003; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.1009; or

(iv) The manufacturer renders inaccurate any test data submitted pursuant to § 86.1009; or

(v) Any EPA Enforcement Officer is denied the opportunity to conduct activities related to entry and access as authorized in § 86.1006 of this part and in a warrant or court order presented to the manufacturer or the party in charge of a facility in question; or

(vi) EPA Enforcement Officers are unable to conduct activities related to entry and access as authorized in § 86.1006 of this part because a manufacturer has located a facility in a foreign jurisdiction where local law prohibits those activities; or

(vii) The manufacturer refuses to or in fact does not comply with the requirements of §§ 86.1004(a), 86.1005, 86.1007, 86.1008, 86.1010, 86.1011, or 86.1013.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraph (e)(1) (i), (ii), or (vii) of this section where such refusal or denial is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but are not limited to, any uncontrollable factors which result in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturers to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanction of suspending a certificate may be imposed for the reasons outlined in paragraph (e)(1) (iii), (iv), or (v) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a light-duty truck or heavy-duty engine is proposed to be suspended under paragraph (e)(1)(v) of this section and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.1006 in fact occurred, if the manufacturer wishes to contend that, although the violation occurred, the vehicle or engine configuration or engine family in question was not involved in the violation to a degree that would warrant suspension of certification under paragraph (e)(1)(v) of this section, he shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (e)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014, and

(ii) Not apply to vehicles or engines no longer in the hands of the manufacturer.

(7) Any voiding of a certificate of conformity under paragraph (e)(4) of this section shall be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10682, Mar. 15, 1985, as amended at 54 FR 14493, Apr. 11, 1989]

§ 86.091-35 Labeling.

(a) The manufacturer of any motor vehicle (or motor vehicle engine) subject to the applicable emission standards (and family emission limits, as appropriate) of this subpart, shall, at the time of manufacture, affix a permanent legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles (or engines) available for sale to the public and covered by a certificate of conformity under § 86.091-30(a).

(1) *Light-duty vehicles.* (i) A permanent, legible label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches), engine family identification and evaporative family identification;

(D) Engine tune-up specifications and adjustments, as recommended by the manufacturer in accordance with the applicable emission standards (or family emission limits, as appropriate), including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (*e.g.,* idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable), as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tune-up and what accessories (*e.g.,* air conditioner), if any, should be in operation;

(E) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to light-duty vehicles;

(F) For vehicles which are part of the diesel particulate averaging program, the family particulate emission limit to which the vehicle is certified;

(G) For vehicles that have been exempted from compliance with the emission standards at high altitude, as specified in § 86.087-8(h),

(*1*) A highlighted statement (*e.g.,* underscored or boldface letters) that the vehicle is certified to applicable emission standards at low altitude only,

(*2*) A statement that the vehicle's unsatisfactory performance under high-altitude conditions makes it unsuitable for principal use at high altitude, and

(*3*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart V do not apply when the vehicle is tested at high altitude; and

(H) For vehicles that have been exempted from compliance with the emission standards at low altitude, as specified in § 86.087-8(i),

(*1*) A highlighted statement (*e.g.,* underscored or boldface letters) that the vehicle is certified to applicable emission standards at high altitude only, and

(*2*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart V do not apply when the vehicle is tested at low altitude.

(2) *Light-duty trucks.* (i) A legible permanent label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label.

(A) The label heading: Important Vehicle Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family identification;

(D) Engine tune-up specifications and adjustments, as recommended by the manufacturer in accordance with the applicable emission standards (or family emission limits, as appropriate), including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (*e.g.*, idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable), as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tune-up and what accessories (*e.g.*, air conditioner), if any, should be in operation. If adjustments or modifications to the vehicle are necessary to insure compliance with emission standards (or family emission limits, as appropriate) at either high or low altitude, the manufacturer shall either include the instructions for such adjustments on the label, or indicate on the label where instructions for such adjustments may be found. The label shall indicate whether the engine tune-up or adjustment specifications are applicable to high altitude, low altitude or both;

(E) The prominent statement: "This vehicle conforms to U.S. EPA regulations applicable to 19— Model Year New Light-Duty Trucks."

(F) If the manufacturer is provided an alternate useful-life period under the provisions of § 86.088-21(f), the prominent statement: "This vehicle has been certified to meet U.S. EPA standards for a useful-life period of — years or —— miles of operation, whichever occurs first. This vehicle's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than years of miles (*e.g.*, hours, or miles only);

(G) A statement, if applicable, that the adjustments or modifications indicated on the label are necessary to ensure emission control compliance at the altitude specified;

(H) A statement, if applicable, that the high-altitude vehicle was designated or modified for principal use at high altitude. This statement must be affixed by the manufacturer at the time of assembly or by any dealer who performs the high-altitude modification or adjustment prior to sale to an ultimate purchaser;

(I) For vehicles that have been exempted from compliance with the high-altitude emission standards, as specified in § 86.088-9(g)(2),

(*1*) A highlighted statement (*e.g.*, underscored or boldface letters) that the vehicle is certified to applicable emission standards at low altitude only,

(*2*) A statement that the vehicle's unsatisfactory performance under high-altitude conditions makes it unsuitable for principal use at high altitude, and

(*3*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart I do not apply when the vehicle is tested at high altitude; and,

(J) For vehicles which are included in the diesel particulate averaging program, the family particulate emission limit to which the vehicle is certified.

(K) For vehicles which are included in the light-duty truck NO_x averaging program, the family NO_x emission limit to which the vehicle is certified.

(3) *Heavy-duty engines.* (i) A permanent legible label shall be affixed to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Important Engine Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family and model designations;

(D) Date of engine manufacture (month and year). The manufacturer may, in lieu of including the date of manufacture on the engine label, maintain a record of the engine manufacture dates. The manufacturer shall provide the date of manufacture records to the Administrator upon request;

(E) Engine specifications and adjustments as recommended by the manufacturer. These specifications should indicate the proper transmission position during tuneup and what accessories (*e.g.,* air conditioner), if any, should be in operation;

(F) For Otto-cycle engines the label should include the idle speed, ignition timing, and the idle air-fuel mixture setting procedure and value (*e.g.,* idle CO, idle air-fuel ratio, idle speed drop), and valve lash;

(G) For diesel engines the label should include the advertised hp at rpm, fuel rate at advertised hp in mm^3/stroke, valve lash, initial injection timing, and idle speed;

(H) The prominent statement: "This engine conforms to U.S. EPA regulations applicable to 19— Model Year New Heavy-Duty Engines."

(I) If the manufacturer is provided with an alternate useful-life period under the provisions of § 86.088-21(f), the prominent statement: "This engine has been certified to meet U.S. EPA standards for a useful-life period of —— miles or — hours of operation, whichever occurs first. This engine's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than miles or hours (*e.g.,* years, or hours only);

(J) *For diesel engines.* The prominent statement: "This engine has a primary intended service application as a _____-heavy-duty engine." (The primary intended service applications are light, medium, and heavy, as defined in § 86.085-2);

(K) *For Otto-cycle engines.* One of the following statements, as applicable:

(*1*) For engines certified to the emission standards of § 86.091-10(a)(1)(i) or § 86.091-10(a)(1)(iii), the statement: "This engine is certified for use in all heavy-duty vehicles."

(*2*) For gasoline-fueled engines certified under the provisions of § 86.091-10(a)(3)(i), the statement: "This engine is certified for use in all heavy-duty vehicles under the special provision of 40 CFR 86.091-10(a)(3)(i)."

(*3*) For engines certified to the emission standards of § 86.091-10(a)(1)(ii) or § 86.091-10(a)(1)(iv), the statement: "This engine is certified for use only in heavy-duty vehicles with a gross vehicle weight rating above 14,000 lbs."

(L) For diesel engines which are included in the diesel heavy-duty particulate averaging program, the family particulate emission limit to which the engine is certified.

(M) For any heavy-duty engines which are included in the heavy-duty NO_x averaging program, the family NO_x emission limit to which the engine is certified.

(iv) The label may be made up of one or more pieces: *Provided,* That all pieces are permanently attached to the same engine or vehicle part as applicable.

(4)(i) *Gasoline-fueled and methanol-fueled heavy-duty vehicles.* A permanent, legible label shall be affixed in a readily visible position in the engine compartment. If such vehicles do not have an engine compartment, the label required in paragraphs (a)(4) and (g)(1) of this section shall be affixed in a readily visible position on the operator's enclosure or on the engine.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The lable shall contain the following information lettered in the English language in block letters and numericals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Evaporative family identification;

(D) The maximum nominal fuel tank capacity (in gallons) for which the evaporative control system is certified; and

(E) One of the following, as appropriate:

(*1*) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to gasoline-fueled heavy-duty vehicles.

(*2*) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to methanol-fueled heavy-duty vehicles.

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle (or engine) conforms to any applicable state emission standards for new motor vehicles (or new motor vehicle engines) or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the vehicle (or engine).

(c)(1) The manufacturer of any light-duty vehicle or light-duty truck subject to the emission standards (or family emission limits, as appropriate) of this subpart shall, in addition and subsequent to setting forth those statements on the label required by the Department of Transportation (DOT) pursuant to 49 CFR 567.4, set forth on the DOT label or on an additional label located in proximity to the DOT label and affixed as described in 40 CFR 567.4(b), the following information in the English language, lettered in block letters and numerals not less than three thirty-seconds of an inch high, of a color that contrasts with the background of the label:

(i) The Heading: "Vehicle Emission Control Information."

(ii)(A) *For light-duty vehicles,* the statement: "This Vehicle Conforms to U.S. EPA Regulations Applicable to 19—Model Year New Motor Vehicles."

(B) *For light-duty trucks.* (*1*) The statement: "This vehicle conforms to U.S. EPA regulations applicable to 19—Model Year New Light-Duty Trucks."

(*2*) If the manufacturer is provided an alternate useful-life period under the provisions of § 86.088-21(f), the prominent statement: "This vehicle has been certified to meet U.S. EPA standards for a useful-life period of — years or —— miles of operation, whichever occurs first. This vehicle's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternative useful life in terms other than years or miles (*e.g.*, hours, or miles only).

(iii) One of the following statements, as applicable, in letters and numerals not less than six thirty-seconds of an inch high and of a color that contrasts with the background of the label:

(A) For all vehicles certified as non-catalyst-equipped: "NON-CATALYST";

(B) For all vehicles certified as catalyst-equipped which are included in a manufacturer's catalyst control program for which approval has been given by the Administrator: "CATALYST—APPROVED FOR IMPORT";

(C) For all vehicles certified as catalyst-equipped which are not included in a manufacturer's catalyst control program for which prior approval has been given by the Administrator: "CATALYST";

(2) In lieu in of selecting either of the labeling options of paragraph (c)(1) of this section, the manufacturer may add the information required by paragraph (c)(1)(iii) of this section to the labeling required by paragraph (a) of this section. The required information will be set forth in the manner prescribed by paragraph (c)(1)(iii) of this section.

(d) Incomplete light-duty trucks or incomplete heavy-duty vehicles optionally certified as light-duty trucks shall have the following prominent statement printed on the label required by paragraph (a)(2) of this section in lieu of the statement required by paragraph (a)(2)(iii)(E) of this section: "This vehicle conforms to U.S. EPA regulations applicable to 19——

Model Year New Light-Duty Trucks when completed at a maximum curb weight of —— pounds or at a maximum gross vehicle weight rating of —— pounds or with a maximum frontal area of —— square feet."

(e) Incomplete heavy-duty vehicles having a gross vehicle weight rating of 8,500 pounds or less shall have one of the following statements printed on the label required by paragraph (a)(3) of this section in lieu of the statement required by paragraph (a)(3)(iii)(H) of this section: "This engine conforms to U.S. EPA regulations applicable to 19—— Model Year New Heavy-Duty Engines when installed in a vehicle completed at a curb weight of more than 6,000 pounds or with a frontal area of greater than 45 square feet."

(f) The manufacturer of any incomplete light-duty vehicle or light-duty truck shall notify the purchaser of such vehicle of any curb weight, frontal area, or gross vehicle weight rating limitations affecting the emission certificate applicable to that vehicle. This notification shall be transmitted in a manner consistent with National Highway Traffic Safety Administration safety notification requirements published in 49 CFR Part 568.

(g)(1)(i) Incomplete gasoline-fueled heavy-duty vehicles shall have the following prominent statement printed on the label required in paragraph (a)(4) of this section: "(Manufacturer's corporate name) has determined that this vehicle conforms to U.S. EPA regulations applicable to 19__ Model Year New Gasoline-Fueled Heavy-Duty Vehicles when completed with a nominal fuel tank capacity not to exceed ___ gallons. Persons wishing to add fuel tank capacity beyond the above maximum must submit a written statement to the Administrator that the hydrocarbon storage system has been upgraded according to the requirements of 40 CFR 86.091-35(g)(2)."

(ii) Incomplete methanol-fueled heavy-duty vehicles shall have the following prominent statement printed on the label required in paragraph (a)(4) of this section: "(Manufacturer's corporate name) has determined that this vehicle conforms to U.S. EPA regulations applicable to 19__ Model Year New Methanol-Fueled Heavy-Duty Vehicles when completed with a nominal fuel tank capacity not to exceed __ gallons. Persons wishing to add fuel tank capacity beyond the above maximum must submit a written statement to the Administrator that the hydrocarbon storage system has been upgraded according to the requirements of 40 CFR 86.091-35(g)(2)."

(2) Persons wishing to add fuel tank capacity beyond the maximum specified on the label required in paragraph (g)(1) of this section shall:

(i) Increase the amount of fuel tank vapor storage material according to the following function:

$$Cap_f = Cap_i \left(\frac{T.\ Vol.}{Max.\ Vol.}\right)$$

Where:

Cap_f = final amount of fuel tank vapor storage material, grams.

Cap_i = initial amount of fuel tank vapor storage material, grams.

T. Vol. = total fuel tank volume of completed vehicle, gallons.

Max. Vol. = maximum fuel tank volume as specified on the label required in paragraph (g)(1) of this section, gallons.

(ii) Use, if applicable, hosing for fuel vapor routing which is at least as impermeable to hydrocarbon vapors as that used by the primary manufacturer.

(iii) Use vapor storage material with the same adsorptive characteristics as that used by the primary manufacturer.

(iv) Connect, if applicable, any new hydrocarbon storage device to the existing hydrocarbon storage device in series such that the original hydrocarbon storage device is situated between the fuel tank and the new hydrocarbon storage device. The original hydrocarbon storage device shall be sealed such that vapors cannot reach the atmosphere. The elevation of the original hydrocarbon storage device shall be equal to or lower than the new hydrocarbon storage device.

(v) Submit a written statement to the Administrator that paragraphs (g)(2)(i) through (g)(2)(iv) of this section have been complied with.

(3) If applicable, the Administrator will send a return letter verifying the receipt of the written statement required in paragraph (g)(2)(v) of this section.

(h)(1) Light-duty trucks and heavy-duty engines for which nonconformance penalties are to be paid in accordance with § 86.1113-87(b) shall have the following information printed on the label required in paragraph (a) of this section or on a separate permanent legible label in the English language and located in proximity to the label required in paragraph (a) of this section. The manufacturer shall begin labeling production engines or vehicles within 10 days after the completion of the PCA.

(i) The statement: "The manufacturer of this engine/vehicle will pay a penalty to be allowed to introduce it into commerce at an emission level higher than the applicable emission standard. The compliance level (or new emission standard) for this engine/vehicle is ____." (The manufacturer shall insert the applicable pollutant and compliance level calculated in accordance with § 86.1112-87(a).)

(2) If a manufacturer introduces an engine or vehicle into commerce prior to the compliance level determination of § 86.1112-87(a), it shall provide the engine or vehicle owner with a label as described above to be affixed in a location in proximity to the label required in paragraph (a) of this section within 30 days of the completion of the PCA.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10690, Mar. 15, 1985, as amended at 54 FR 14498, Apr. 11, 1989]

§ 86.092-1 General applicability.

(a) The provisions of this subpart apply to 1992 and later model year new Otto-cycle and diesel light-duty vehicles, 1992 and later model year new Otto-cycle and diesel light-duty trucks, and 1992 and later model year new Otto-cycle and diesel heavy-duty engines.

(b) *Optional applicability.* A manufacturer may request to certify any heavy-duty vehicle of 10,000 pounds Gross Vehicle Weight Rating or less in accordance with the light-duty truck provisions. Heavy-duty engine or vehicle provisions do not apply to such a vehicle.

(c) [Reserved]

(d) *Alternative Durability Program.* For 1992 and later model year light-duty vehicles and light-duty trucks, a manufacturer may elect to participate in the Alternative Durability Program. This optional program provides an alternative method of determining exhaust emission control system durability.

The general procedures and a description of the programs are contained in § 86.085-13 and specific provisions on test vehicles and compliance procedures are contained in § 86.092-24 and § 86.091-28 respectively.

(e) *Small volume manufacturers.* Special certification procedures are available for any manufacturer whose projected combined U.S. sales of light-duty vehicles, light-duty trucks, heavy-duty vehicles, and heavy-duty engines in its product line (including all vehicles and engines imported under the provisions of 40 CFR 85.1505 and 40 CFR 85.1509) are fewer than 10,000 units for the model year in which the manufacturer seeks certification. To certify its product line under these optional procedures, the small-volume manufacturer must first obtain the Administrator's approval. The manufacturer must meet the eligibility criteria specified in § 86.092-14(b) before the Administrator's approval will be granted. The small-volume manufacturer's certification procedures are described in § 86.092-14.

(f) *Optional procedures for determining exhaust opacity.* (1) The provisions of subpart I apply to tests which are performed by the Administrator, and optionally, by the manufacturer.

(2) Measurement procedures, other than that described in subpart I, may be used by the manufacturer provided the manufacturer satisfies the requirements of § 86.091-23(f).

(3) When a manufacturer chooses to use an alternative measurement procedure it has the responsibility to determine whether the results obtained by

the procedure will correlate with the results which would be obtained from the measurement procedure in subpart I. Consequently, the Administrator will not routinely approve or disapprove any alternative opacity measurement procedure or any associated correlation data which the manufacturer elects to use to satisfy the data requirements for subpart I.

(4) If a confirmatory test(s) is performed and the results indicate there is a systematic problem suggesting that the data generated under an optional alternative measurement procedure do not adequately correlate with subpart I data, EPA may require that all certificates of conformity not already issued be based on data from subpart I procedures.

[55 FR 7187, Feb. 28, 1990]

§ 86.092-2 Definitions.

The definitions of § 86.091-2 remain effective. The definitions listed in this section apply beginning with the 1992 model year.

(a) *Proven emission control systems* are emission control components or systems (and fuel metering systems) that have completed full durability testing evaluation over a vehicle's useful life in some other certified engine family, or have completed bench or road testing demonstrated to be equal or more severe than certification mileage accumulation requirements. Alternatively, proven components or systems are those that are determined by EPA to be of comparable functional quality and manufactured using comparable materials and production techniques as components or systems which have been durability demonstrated in some other certified engine family. In addition, the components or systems must be employed in an operating environment (e.g., temperature, exhaust flow, etc.,) similar to that experienced by the original or comparable components or systems in the original certified engine family.

(b) *Unproven emission control systems* are emission control components or systems (and fuel metering systems) that do not qualify as proven emission control systems.

(c) *Similar systems* are engine, fuel metering and emission control system combinations which use the same fuel (e.g., gasoline, diesel, etc.), combustion cycle (i.e., two or four stroke), general type of fuel system (i.e., carburetor or fuel injection), catalyst system (e.g., none, oxidization, three-way plus oxidization, three-way only, etc.), fuel control system (i.e., feedback or non-feedback), secondary air system (i.e., equipped or not equipped) and EGR (i.e., equipped or not equipped).

(d) *Conveniently available* service facility and spare parts for small-volume manufacturers means that the vehicle manufacturer has a qualified service facility at or near the authorized point of sale or delivery of its vehicles and maintains an inventory of all emission-related spare parts or has made arrangements for the part manufacturers to supply the parts by expedited shipment (e.g., utilizing overnight express delivery service, UPS, etc.).

[55 FR 7187, Feb. 28, 1990]

§ 86.092-14 Small-volume manufacturers certification procedures.

(a) The small-volume manufacturers certification procedures described in paragraphs (b) and (c) of this section are optional. Small-volume manufacturers may use these optional procedures to demonstrate compliance with the general standards and specific emission requirements contained in this subpart.

(b)(1) The optional small-volume manufacturers certification procedures apply to light-duty vehicles, light-duty trucks, heavy-duty vehicles, and heavy-duty engines produced by manufacturers with U.S. sales, including all vehicles and engines imported under the provisions of 40 CFR 85.1505 and 40 CFR 85.1509 (for the model year in which certification is sought) of fewer than 10,000 units (Light-Duty Vehicles, Light-Duty Trucks, Heavy-Duty Vehicles and Heavy-Duty Engines combined).

(2) For the purpose of determining the applicability of paragraph (b)(1) of this section, the sales the Administrator shall use shall be the aggregate of the projected or actual sales of those vehicles and/or engines in any

of the groupings identified below in this subparagraph.

(i) Vehicles and/or engines produced by two or more firms, one of which is 10 percent or greater part owned by another;

(ii) Vehicles and/or engines produced by any two or more firms if a third party has equity ownership of 10 percent or more in each of the firms;

(iii) Vehicles and/or engines produced by two or more firms having a common corporate officer(s) who is(are) responsible for the overall direction of the companies;

(iv) Vehicles and/or engines imported or distributed by all firms where the vehicles and/or engines are manufactured by the same entity and the importer or distributer is an authorized agent of the entity.

(3) If the aggregated sales, as determined in paragraph (b)(2) of this section are less than 301 units, the manufacturers in the aggregated relationship may certify under the provisions in this section that apply to manufacturers with sales of less than 301 units.

(4) If the aggregated sales, as determined in paragraph (b)(2) of this section are greater than 300 but fewer than 10,000 units, the manufacturers in the aggregated relationship may certify under the provisions in this section that apply to manufacturers with sales from and including 301 through 9,999 motor vehicles and motor vehicles engines per year.

(5) If the aggregated sales, as determined in paragraph (b)(2) of this section are equal to or greater than 10,000 units, then the manufacturers involved in the aggregated relationship will be allowed to certify a number of units under the small-volume engine family certification procedures (40 **CFR** 86.092-24(e)) in accordance with the criteria identified below in this subparagraph.

(i) If a manufacturer purchases less than 50 percent of another manufacturer, each manufacturer retains its right to certify 9,999 units using the small-volume engine family certification procedures.

(ii) If a manufacturer purchases 50 percent or more of another manufacturer, the manufacturer with the over 50 percent interest must share, with the manufacturer it purchased, its 9,999 units under the small-volume engine family certification procedures.

(iii) In a joint venture arrangement (50/50 ownership) between two manufacturers, each manufacturer retains its eligibility for 9,999 units under the small-volume engine family certification procedures, but the joint venture must draw its maximum 9,999 units from the units allocated to its parent manufacturers.

(c) Small-volume manufacturers shall demonstrate compliance with the applicable sections of this subpart. The appropriate model year of the following applicable sections shall be determined in accordance with § 86.084-4:

(1) Sections 86.092-1, 86.092-2, 86.090-3, 86.084-4, 86.090-5, 86.078-6, 86.078-7, and 86.090-8 through 86.090-11 of this subpart are applicable.

(2) Sections 86.080-12 of this subpart is not applicable.

(3) Section 86.085-13, 86.092-14, 86.084-15, and 86.085-20 of this subpart are applicable.

(4) Small-volume manufacturers shall include in their records all of the information that EPA requires in §86.090-21 of this subpart. This information will be considered part of the manufacturer's application for certification. However, the manufacturer is not required to submit the information to the Administrator unless the Administrator requests it.

(5) Section 86.085-22 of this subpart is applicable except as noted below.

(i) Small-volume light-duty vehicle and light-duty truck manufacturers may satisfy the requirements of paragraph (e) of § 86.085-22 by including a statement of compliance on adjustable parameters in the application for certification. In the statement of compliance the manufacturer shall state that the limits, stops, seals, or other means used to inhibit adjustment have been designed to accomplish their intended purpose based on good engineering practice and past experience. If the vehicle parameter is adjustable the vehicle must meet emission standards with the parameter set any place within the adjustable range (Reference § 86.090-21 of this subpart).

(6) Section 86.090-23 of this subpart is applicable.

(7) Section 86.092-24 of this subpart is applicable except as noted below.

(i) Small-volume manufacturers may satisfy the requirements of paragraph (b) and (c) of § 86.092-24 of this subpart by:

(A) *Emission-data*—Selecting one emission-data test vehicle (engine) per engine family by the worst-case emissions criteria as follows:

(*1*) *Light-duty vehicles and light-duty trucks.* The manufacturer shall select the vehicle with the heaviest equivalent test weight (including options) within the engine family. Then within that vehicle the manufacturer shall select, in the order listed, the highest road load power, largest displacement, the transmission with the highest numerical final gear ratio (including overdrive), the highest numerical axle ratio offered in the engine family, and the maximum fuel flow calibration.

(*2*) *Heavy-duty Otto-cycle engines.* The manufacturer shall select one emission-data engine first based on the largest displacement within the engine family. Then within the largest displacement the manufacturer shall select, in the order listed, highest fuel flow at the speed of maximum rated torque, the engine with the most advanced spark timing, no EGR or lowest EGR flow, and no air pump or lowest actual flow air pump.

(*3*) *Heavy-duty diesel engines.* The manufacturer shall select one emission-data engine based on the highest fuel feed per stroke, primarily at the speed of maximum rated torque and secondarily at rated speed.

(B) Testing light-duty vehicles or light-duty truck emission-data vehicles at any service accumulation distance of at least 2,000 miles (3,219 kilometers) or, catalyst equipped heavy-duty emission-data engines at any service accumulation time of at least 62 hours, or non-catalyst equipped heavy-duty engine emission-data engines at any service accumulation time determined by the manufacturer to result in stabilized emissions. The emission performance of the emission-data vehicle or engine must be stabilized prior to emission testing.

(C) *Durability data*—Satisfying the durability-data requirements by complying with the applicable procedures below:

(*1*) Manufacturers with aggregated sales of less than 301 motor vehicles and motor vehicle engines per year may use assigned deterioration factors that the Administrator determines and prescribes. The factors will be the Administrator's estimate, periodically updated and published in an advisory letter or advisory circular, of the 70th percentile deterioration factors calculated using the industrywide data base of previously completed durability-data vehicles or engines used for certification. However, the manufacturer may, at its option, accumulate miles (hours) on a durability-data vehicle (engine) and complete emission tests for the purpose of establishing its own deterioration factors.

(*2*) Manufacturers with aggregated sales from and including 301 through 9,999 motor vehicles and motor vehicle engines per year certifying light-duty vehicle exhaust emissions from vehicles equipped with proven emission control systems shall use assigned deterioration factors that the manufacturer determines based on its good engineering judgment. However, the manufacturer may not use deterioration factors less than either the average or 70th percentile of all of that manufacturer's deterioration factor data, whichever is less. These minimum deterioration factors shall be calculated according to procedures in paragraph (c)(7)(i)(C)(*2*)(*i*), of this section. If the manufacturer does not have at least two data points to calculate these manufacturer specific average deterioration factors, then the deterioration factors shall be no less than the EPA supplied industrywide deterioration factors. However, the manufacturer may, at its option, accumulate miles on a durability-data vehicle and complete emission tests for the purpose of establishing its own deterioration factors.

(*i*) The manufacturer's minimum deterioration factors shall be calculated using the deterioration factors from all engine families, within the same vehicle/engine-fuel usage category (e.g., gasoline-fueled light-duty vehicle, etc.)

previously certified to the same emission standards. The manufacturer shall use only deterioration factors engine families previously certified by the manufacturer and the deterioration factors shall not be included in the calculation more than once. The deterioration factors for each pollutant shall be calculated separately. The manufacturer may, at its option, limit the deterioration factors used in the calculation of the manufacturer's minimum deterioration factors to those from all similar systems to the system being certified if sufficient data (i.e., from at least two certified systems) exists. All data eligible to be grouped as similar system data shall be used in calculating similar system deterioration factors. Any deterioration factors used in calculating similar system deterioration factors shall not be included in calculating the manufacturer's minimum deterioration factors used to certify any of the manufacturer's remaining vehicle systems.

(*3*) Manufacturers with aggregated sales from 301 through 9,999 motor vehicles and motor vehicle engines and certifying light-duty vehicle exhaust emissions from vehicles equipped with unproven emission control systems shall use deterioration factors that the manufacturer determines from official certification durability data generated by vehicles from engine families representing a minimum of 25 percent of the manufacturer's sales equipped with unproven emission control systems. The sales projections are to be based on total sales projected for each engine/system combination. The durability-data vehicle (engine) mileage accumulation and emission tests are to be conducted according § 86.092-26 of this subpart. The manufacturer must develop deterioration factors by generating durability data in accordance with § 86.092-26 of this subpart on a minimum of 25 percent of the manufacturer's projected sales (by engine/system combination) that is equipped with unproven emission control systems. The manufacturer must complete the 25 percent durability requirement before the remainder of the manufacturer's sales equipped with unproven emission control systems is certified using manufacturer-determined assigned deterioration factors. Alternatively, any of these manufacturers may, at their option, accumulate miles on durability-data vehicles and complete emission tests for the purpose of establishing their own deterioration factors on the remaining sales.

(*4*) For light-duty vehicle, light-duty truck, and heavy-duty vehicle evaporative emissions and light-duty truck, and heavy-duty engine exhaust emissions, deterioration factors shall be determined in accordance with § 86.092-24 of this subpart.

(ii) Paragraphs (d) and (e) of § 86.092-24 of this subpart are not applicable.

(8) Section 86.090-25 of this subpart is applicable to maintenance performed on durability-data light-duty vehicles, light-duty trucks, heavy-duty vehicles, and heavy-duty engines when the manufacturer completes durability-data vehicles or engines; section 86.087-38 of this subpart is applicable to the recommended maintenance the manufacturer includes in the maintenance instructions furnished the purchasers of new motor vehicles and new motor vehicle engines under § 86.087-38 of this subpart.

(9)(i) Section 86.092-26 of this subpart is applicable if the manufacturer completes durability-data vehicles or engines.

(ii) Section 86.085-27 of this subpart is applicable.

(10) Sections 86.090-28 and 86.090-29 of this subpart are applicable.

(11)(i) Section 86.090-30 of this subpart is applicable, except for paragraph (a)(2) and (b) of that section. In the place of these paragraphs, small-volume manufacturer shall comply with paragraphs (c)(11)(ii) through (v) of this section, as shown below.

(ii) Small-volume manufacturers shall submit an application for certification containing the following:

(A) The names, addresses, and telephone numbers of the persons the manufacturer authorizes to communicate with us.

(B) A brief description of the vehicles (or engines) covered by the certificate (the manufacturers' sales data book or advertising, including specifications, may satisfy this requirement for most manufacturers). The description shall include, as a minimum, the following items as applicable:

(*1*) Engine evaporative family names and vehicle (or engine) configurations.

(*2*) Vehicle carlines or engine models to be listed on the certificate of conformity.

(*3*) The test weight and horsepower setting for each vehicle or engine configuration.

(*4*) Projected sales.

(*5*) Combustion cycle.

(*6*) Cooling mechanism.

(*7*) Number of cylinders.

(*8*) Displacement.

(*9*) Fuel system type.

(*10*) Number of catalytic converters, type, volume, composition, surface area, and total precious metal loading.

(*11*) Method of air aspiration.

(*12*) Thermal reactor characteristics.

(*13*) Suppliers' and/or manufacturers' name and model number of any emission related items of the above, if purchased from a supplier who uses the items in its own certified vehicles(s) or engine(s).

(*14*) A list of emission component part numbers.

(*15*) Drawings, calibration curves, and descriptions of emission related components, including those components regulated under paragraph (e) of § 86.085-22 of this subpart, and schematics of hoses and other devices connecting these components.

(*16*) Vehicle adjustments or modifications necessary for light-duty trucks to assure that they conform to high-altitude standards.

(*17*) A description of the light-duty vehicles and light-duty trucks which are exempted from the high-altitude emission standards.

(*18*) Proof that the manufacturer has obtained or entered an agreement to purchase, when applicable, the insurance policy, required by § 85.1510(b). The manufacturer may submit a copy of the insurance policy or purchase agreement as proof that the manufacturer has obtained or entered an agreement to purchase the insurance policy.

(C) The results of all emission tests the manufacturer performs to demonstrate compliance with the applicable standards.

(D)(*1*) The following statement signed by the authorized representative of the manufacturer: "The vehicles (or engines) described herein have been tested in accordance with (list of the applicable subparts A, B, D, I, M, N, or P) of part 86, title 40, United States Code of Federal Regulations, and on the basis of those tests are in conformance with that subpart. All of the data and records required by that subpart are on file and are available for inspection by the EPA Administrator. We project the total U.S. sales of vehicles (engines) subject to this subpart (including all vehicles and engines imported under the provisions of 40 CFR 85.1505 and 40 CFR 85.1509 to be fewer than 10,000 units."

(*2*) A statement as required by and contained in paragraph (c)(5) of this section signed by the authorized representative of the manufacturer.

(*3*) A statement that the vehicles or engines described in the manufacturer's application for certification are not equipped with auxiliary emission control devices which can be classified as a defeat device as defined in § 86.092-2 of this subpart.

(*4*) A statement of compliance with section 206(a)(3) of the Clean Air Act.

(*5*) A statement that, based on the manufacturer's engineering evaluation and/or emission testing, the light-duty vehicles comply with emission standards at high altitude unless exempt under paragraph (h) of § 86.090-8 of this subpart.

(*6*) A statement that, based on the manufacturer's engineering evaluation and/or emission testing, the light-duty trucks sold for principle use at designated high-altitude locations comply with the high-altitude emission requirements and that all other light-duty trucks are at least capable of being modified to meet high-altitude standards unless exempt under paragraph (g)(2) of § 86.090-9 of this subpart.

(*7*) A statement affirming that the manufacturer will provide a list of emission and emission-related service parts, including part number designations and sources of parts, to the vehicle purchaser for all emission and emission-related parts which might affect vehicle emission performance throughout the useful life of the vehicle. Secondly, it must state that qualified service facilities and emission-related repair parts will be conveniently available to serve its vehicles. In addition, if service facilities are not available at the point of sale or distribution, the manufacturer must indicate that the vehicle purchaser will be provided information identifying the closest authorized service facility to the point of sale, if in the United States, or the closest authorized service facility to the point of distribution to the ultimate purchaser if the vehicle was purchased outside of the United States by the ultimate purchaser. Such information should also be made available to the Administrator upon request.

(E) Manufacturers utilizing deterioration factors determined by the manufacturer based on its good engineering judgment (re: paragraph (c)(7)(i)(C)(*2*) of this section) shall provide a description of the method(s) used by the manufacturer to determine the deterioration factors.

(iii) If the manufacturer meets requirements of this subpart, the Administrator will issue a certificate of conformity for the vehicles or engines described in the application for certification.

(iv) The certificate will be issued for such a period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any vehicle or engine covered by the certificate will meet the requirements of the Act and of this subpart.

(v)(A) If, after a review of the statements and descriptions submitted by the manufacturer, the Administrator determines that the manufacturer has not met the applicable requirements, the Administrator shall notify the manufacturer in writing of his intention to deny certification, setting forth the basis for his determination. The manufacturer may request a hearing on the Administrator's determination.

(B) If the manufacturer does not request a hearing or present the required information the Administrator will deny certification.

(12) Sections 86.079-31 and 86.079-32 of this subpart are not applicable.

(13) Under § 86.079-33 of this subpart, small-volume manufacturers are covered by the following.

(i) Small-volume manufacturers may make production changes (running changes) without receiving the Administrator's prior approval. The manufacturer shall assure (by conducting emission tests as it deems necessary) that the affected vehicles (engines) remain in compliance with the requirements of this part.

(ii) The manufacturer shall notify the Administrator within seven days after implementing any production related change (running change) that would affect vehicle emissions. This notification shall include any changes to the information required under paragraph (c)(11)(ii) of this section. The manufacturer shall also amend as necessary its records required under paragraph (c)(4) of this section to confirm with the production design change.

(14) Section 86.082-34 of this subpart is not applicable.

(15) Sections 86.092-35, 86.079-36, 86.082-37, 86.087-38 and 86.084-39 of this subpart are applicable.

(Approved by the Office of Management and Budget under the control number 2060-0104)

[55 FR 7187, Feb. 28, 1990]

§ 86.092-24 Test vehicles and engines.

(a)(1) The vehicles or engines covered by an application for certification will be divided into groupings of engines which are expected to have similar emission characteristics throughout their useful life. Each group of engines with similar emission characteristics shall be defined as a separate engine family.

(2) To be classed in the same engine family, engines must be identical in all the following respects:

(i) The cylinder bore center-to-center dimensions.

(ii)—(iii) [Reserved]

(iv) The cylinder block configuration (air cooled or water cooled: L-6, 90° V-8, etc.).

(v) The location of the intake and exhaust valves (or ports).

(vi) The method of air aspiration.

(vii) The combustion cycle.

(viii) Catalytic converter characteristics.

(ix) Thermal reactor characteristics.

(x) Type of air inlet cooler (e.g., intercoolers and after-coolers) for diesel heavy-duty engines.

(3)(i) Engines identical in all the respects listed in paragraph (a)(2) of this section may be further divided into different engine families if the Administrator determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(A) The bore and stroke.

(B) The surface-to-volume ratio of the nominally dimensioned cylinder at the top dead center positions.

(C) The intake manifold induction port size and configuration.

(D) The exhaust manifold port size and configuration.

(E) The intake and exhaust valve sizes.

(F) The fuel system.

(G) The camshaft timing and ignition or injection timing characteristics.

(ii) Light-duty trucks and heavy-duty engines produced in different model years and distinguishable in the respects listed in paragraph (a)(2) of this section shall be treated as belonging to a single engine family if the Administrator requires it, after determining that the engines may be expected to have similar emission deterioration characteristics.

(4) Where engines are of a type which cannot be divided into engine families based upon the criteria listed in paragraphs (a)(2) and (a)(3) of this section, the Administrator will establish families for those engines based upon those features most related to their emission characteristics. Engines that are eligible to be included in the same engine family based on the criteria in paragraphs (a)(2) and (a)(3)(i) of this section may be further divided into different engine families if the manufacturer determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(i) The dimension from the center line of the crankshaft to the center line of the camshaft.

(ii) The dimension from the center line of the crankshaft to the top of the cylinder block head face.

(iii) The size of the intake and exhaust valves (or ports).

(5) The gasoline-fueled and methanol-fueled light-duty vehicles and light-duty trucks covered by an application for certification will be divided into groupings which are expected to have similar evaporative emission characteristics throughout their useful life. Each group of vehicles with similar evaporative emission characteristics shall be defined as a separate evaporative emission family.

(6) For gasoline-fueled or methanol-fueled light-duty vehicles and light-duty trucks to be classed in the same evaporative emission family, vehicles must be similar with respect to:

(i) Type of vapor storage device (e.g., canister, air cleaner, crankcase).

(ii) Basic canister design.

(iii) Fuel system.

(7) Where vehicles are of a type which cannot be divided into evaporative emission families based on the criteria listed above, the Administrator will establish families for those vehicles based upon the features most related to their evaporative emission characteristics.

(8)(i) If the manufacturer elects to participate in the Alternative Durability Program, the engine families covered by an application for certification shall be grouped based upon similar engine design and emission control system characteristics. Each of these groups shall constitute a separate engine family group.

(ii) To be classed in the same engine family group, engine families must contain engines identical in all of the following respects:

(A) The combustion cycle.

(B) The cylinder block configuration (air-cooled or water-cooled; L-6, V-8, rotary, etc.).

(C) Displacement (engines of different displacement within 50 cubic inches or 15 percent of the largest displacement and contained within a multi-displacement engine family will be included in the same engine family group).

(D) Catalytic converter usage and basic type (non-catalyst, oxidation catalyst only, three-way catalyst equipped).

(9) Engine families identical in all respects listed in paragraph (a)(8) of this section may be further divided into different engine family groups if the Administrator determines that they are expected to have significantly different exhaust emission control system deterioration characteristics.

(10) A manufacturer may request the Administrator to include in an engine family group, engine families in addition to those grouped under the provisions of paragraph (a)(8) of this section. This request must be accompanied by information the manufacturer believes supports the inclusion of these additional engine families.

(11) A manufacturer may combine into a single engine family group those light-duty vehicle and light-duty truck engine families which otherwise meet the requirements of paragraph (a)(8) through (a)(10) of this section.

(12) The vehicles covered by an application for certification equipped with gasoline-fueled and methanol-fueled heavy-duty engines will be divided into groupings of vehicles on the basis of physical features which are expected to affect evaporative emissions. Each group of vehicles with similar features shall be defined as a separate evaporative emission family.

(13) For gasoline-fueled or methanol-fueled heavy-duty vehicles to be classified in the same evaporative emission family, vehicles must be identical with respect to:

(i) Method of fuel/air metering (i.e., carburetion versus fuel injection).

(ii) Carburetor bowl fuel volume, within a 10 cc range.

(14) For vehicles equipped with gasoline-fueled and methanol-fueled heavy-duty engines to be classified in the same evaporative emission control system, vehicles must be identical with respect to:

(i) Method of vapor storage.

(ii) Method of carburetor sealing.

(iii) Method of air cleaner sealing.

(iv) Vapor storage working capacity, within a 20g range.

(v) Number of storage devices.

(vi) Method of purging stored vapors.

(vii) Method of venting the carburetor during both engine off and engine operation.

(viii) Liquid fuel hose material.

(ix) Vapor storage material.

(15) Where vehicles equipped with gasoline-fueled or methanol-fueled heavy-duty engines are types which cannot be divided into evaporative emission family-control system combinations based on the criteria listed above, the Administrator will establish evaporative emission family-control system combinations for those vehicles based on features most related to their evaporative emission characteristics.

(b) *Emission data*—(1) *Emission-data vehicles.* Paragraph (b)(1) of this section applies to light-duty vehicle and light-duty truck emission-data vehicles.

(i) Vehicles will be chosen to be operated and tested for emission data based upon engine family groupings. Within each engine family, one test vehicle will be selected based on the following criteria: The Administrator shall select the vehicle with the heaviest equivalent test weight (including options) within the family. Then within that vehicle the Administrator shall select, in the order listed, the highest road-load power, largest displacement, the transmission with the highest numerical final gear ratio (including overdrive), the highest numerical axle ratio offered in that engine family, and the maximum fuel flow calibration.

(ii) The Administrator shall select one additional test vehicle from within each engine family. The vehicle selected shall be the vehicle expected to exhibit the highest emissions of those vehicles remaining in the engine family. If all vehicles within the engine family are similar the Administrator may waive the requirements of this paragraph.

(iii) Within an engine family and exhaust emission control system, the manufacturer may alter any emission-data vehicle (or other vehicles such as including current or previous model year emission-data vehicles, fuel economy data vehicles, and development vehicles provided they meet emission-data vehicles' protocol) to represent more than one selection under paragraph (b)(1) (i), (ii), (iv), or (vii) of this section.

(iv) If the vehicles selected in accordance with paragraphs (b)(1) (i) and (ii) of this section do not represent each engine-system combination, then one vehicle of each engine-system combination not represented will be selected by the Administrator. The vehicle selected shall be the vehicle expected to exhibit the highest emissions of those vehicles remaining in the engine family.

(v) For high-altitude exhaust emission compliance for each engine family, the manufacturer shall follow one of the following procedures:

(A) The manufacturer will select for testing under high-altitude conditions the vehicle expected to exhibit the highest emissions from the nonexempt vehicles selected in accordance with paragraphs (b)(1) (ii), (iii), and (iv) of this section or,

(B) In lieu of testing vehicles according to paragraph (b)(1)(v)(A) of this section, a manufacturer may provide a statement in its application for certification that, based on the manufacturer's engineering evaluation of such high-altitude emission testing as the manufacturer deems appropriate,

(*1*) That all light-duty vehicles not exempt under § 86.090-8(h) comply with the emission standards at high altitude; and

(*2*) That light-duty trucks sold for principal use at designated high-altitude locations comply with the high-altitude emission requirements and that all light-duty trucks sold at low altitude, which are not exempt under § 86.091-9(g)(2), are capable of being modified to meet high-altitude standards.

(vi) If 90 percent or more of the engine family sales will be in California, a manufacturer may substitute emission-data vehicles selected by the California Air Resources Board criteria for the selections specified in paragraphs (b)(1) (i), (ii), and (iv) of this section.

(vii)(A) Vehicles of each evaporative emission family will be divided into evaporative emission control systems.

(B) The Administrator will select the vehicle expected to exhibit the highest evaporative emissions, from within each evaporative family to be certified, from among the vehicles represented by the exhaust emission-data selections for the engine family, unless evaporative testing has already been completed on the vehicle expected to exhibit the highest evaporative emissions for the evaporative family as part of another engine family's testing.

(C) If the vehicles selected in accordance with paragraph (b)(1)(vii)(B) of this section do not represent each evaporative emission control system then the Administrator will select the highest expected evaporative emission vehicle from within the unrepresented evaporative system.

(viii) For high-altitude evaporative emission compliance for each evaporative emission family, the manufacturer shall follow one of the following procedures:

(A) The manufacturer will select for testing under high-altitude conditions the one nonexempt vehicle previously selected under paragraphs (b)(1)(vii) (B) or (C) of this section which is expected to have the highest level of evaporative emissions when operated at high altitude or

(B) In lieu of testing vehicles according to paragraph (b)(1)(viii)(A) of this section, a manufacturer may provide a statement in its application for certification that based on the manufacturer's engineering evaluation of such high-altitude emission testing as the manufacturer deems appropriate,

(*1*) That all light-duty vehicles not exempt under § 86.090-8(h) comply with the emission standards at high altitude, and

(*2*) That light-duty trucks sold for principal use at designated high-altitude locations comply with the high-altitude emission requirements and that all light-duty trucks sold at low-altitude, which are not exempt under § 86.091-9(g)(2), are capable of being modified to meet high-altitude standards.

(ix) Vehicles selected under paragraph (b)(1)(v)(A) of this section may be used to satisfy the requirements of (b)(1)(viii)(A) of this section.

(x) *Light-duty trucks only:* (A) The manufacturer may reconfigure any of the low-altitude emission-data vehicles to represent the vehicle configuration required to be tested at high altitude.

(B) The manufacturer is not required to test the reconfigured vehicle at low altitude.

(2) *Otto-cycle heavy-duty emission-data engines.* Paragraph (b)(2) of this section applies to Otto-cycle heavy-duty engines.

(i)-(ii) [Reserved]

(iii) The Administrator shall select a maximum of two engines within each engine family based upon features indicating that they may have the highest emission levels of the engines in the engine family as follows:

(A) The Administrator shall select one emission-data engine first based on the largest displacement within the engine family. Then within the largest displacement the Administrator shall select, in the order listed, highest fuel flow at the speed of maximum rated torque, the engine with the most advanced spark timing, nc EGR or lowest EGR flow, and no air pump or lowest actual flow air pump.

(B) The Administrator shall select one additional engine, from within each engine family. The engine selected shall be the engine expected to exhibit the highest emissions of those engines remaining in the engine family. If all engines within the engine family are similar the Administrator may waive the requirements of this paragraph.

(iv) If the engines selected in accordance with paragraph (b)(2) (ii) and (iii) of this section do not represent each engine displacement-exhaust emission control system combination, then one engine of each engine displacement-exhaust emission control system combination not represented shall be selected by the Administrator.

(v) Within an engine family/displacement/control system combination, the manufacturer may alter any emission-data engine (or other engine including current or previous model year emission-data engines and development engines provided they meet the emission-data engines' protocol) to represent more than one selection under paragraph (b)(2)(iii) of this section.

(3) *Diesel heavy-duty emission-data engines.* Paragraph (b)(3) of this section applies to diesel heavy-duty emission-data vehicles.

(i) Engines will be chosen to be run for emission data based upon engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Engines of each engine family will be divided into groups based upon their exhaust emission control systems. One engine of each system combination shall be run for smoke emission data and gaseous emission data. Either the complete gaseous emission test or the complete smoke test may be conducted first. Within each combination, the engine that features the highest fuel feed per stroke, primarily at the speed of maximum rated torque and secondarily at rated speed, will usually be selected. If there are military engines with higher fuel rates than other engines in the same engine system combinations, then one military engine shall also be selected. The engine with the highest fuel feed per stroke will usually be selected.

(iii) The Administrator may select a maximum of one additional engine within each engine-system combination based upon features indicating that it may have the highest emission levels of the engines of that combination. In selecting this engine, the Administrator will consider such features as the injection system, fuel system, compression ratio, rated speed, rated horsepower, peak torque speed, and peak torque.

(iv) Within an engine family control system combination, the manufacturer may alter any emission-data engine (or other engine including current or previous model year emission-data engines and development engines provided they meet the emission-data engines' protocol) to represent more than one selection under paragraph (b)(3)(ii) and (iii) of this section.

(c) *Durability data*—(1) *Light-duty vehicle durability-data vehicles.* Paragraph (c)(1) of this section applies to light-duty vehicle durability-data vehicles.

(i) A durability-data vehicle will be selected by the Administrator to represent each engine-system combination. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with that control-system combination in that engine family and will be designated by the Administration as to transmission type, fuel system, inertia weight class, and test weight.

(ii) A manufacturer may elect to operate and test additional vehicles to represent any engine-system combination. The additional vehicles must be of the same engine displacement, transmission type, fuel system and inertia weight class as the vehicle selected for that engine-system combination in accordance with the provisions of paragraph (c)(1)(i) of this section. Notice of an intent to operate and test additional vehicles shall be given to the Administrator no later than 30 days following notification of the test fleet selection.

(2) *Light-duty trucks.* Paragraph (c)(2) of this section applies to vehicles, engines, subsystems, or components used to establish exhaust emission deterioration factors for light-duty trucks.

(i) The manufacturer shall select the vehicles, engines, subsystems, or components to be used to determine exhaust emission deterioration factors for each engine-family control system combination. Whether vehicles, engines, subsystems, or components are used, they shall be selected so that their emissions deterioration characteristics may be expected to represent those of in-use vehicles, based on good engineering judgment.

(ii) [Reserved]

(3) *Heavy-duty engines.* Paragraph (c)(3) of this section applies to engines, subsystems, or components used to establish exhaust emission deterioration factors for heavy-duty engines.

(i) The manufacturer shall select the engines, subsystems, or components to be used to determine exhaust emission deterioration factors for each engine-family control system combination. Whether engines, subsystems, or components are used, they shall be selected so that their emissions deterioration characteristics may be expected to represent those of in-use engines, based on good engineering judgment.

(ii) [Reserved]

(d) For purposes of testing under § 86.092-26 (a)(9) or (b)(11), the Administrator may require additional emission-data vehicles (or emission-data engines) and durability-data vehicles (light-duty vehicles only) identical in all material respects to vehicles (or engines) selected in accordance with paragraphs (b) and (c) of this section, *Provided* That the number of vehicles (or engines) selected shall not increase the size of either the emission-data fleet or the durability-data fleet by more than 20 percent or one vehicle (or engine), whichever is greater.

(e)(1) [Reserved]

(2) Any manufacturer may request to certify engine families with combined total sales of fewer than 10,000 light-duty vehicles, light-duty trucks, heavy-duty vehicles, and heavy-duty engines utilizing the procedures contained in § 86.092-14 of this subpart for emission-data vehicle selection and determination of deterioration factors. The deterioration factors shall be applied only to entire engine families.

(f) In lieu of testing an emission-data or durability-data vehicle (or engine) selected under paragraph (b) or (c) of this section, and submitting data therefore, a manufacturer may, with the prior written approval of the Administrator, submit exhaust emission data and/or fuel evaporative emission data, as applicable on a similar vehicle (or engine) for which certification has previously been obtained or for which all applicable data required under § 86.091-23 has previously been submitted.

(g)(1) This paragraph applies to light-duty vehicles and light-duty trucks, but does not apply to the production vehicles selected under paragraph (h) of this section.

(2)(i) Where it is expected that more than 33 percent of a carline, within an engine-system combination, may be equipped with an item (whether that item is standard equipment or an option), the full estimated weight of that item shall be included in the curb weight computation of each vehicle available with that item in that carline, within that engine-system combination.

(ii) Where it is expected that 33 percent or less of the carline, within an engine-system combination, will be equipped with an item (whether that item is standard equipment or an option), no weight for that item will be added in computing the curb weight for any vehicle in that carline, within that engine-system combination, unless that item is standard equipment on the vehicle.

(iii) In the case of mutually exclusive options, only the weight of the heavier option will be added in computing the curb weight.

(iv) Optional equipment weighing less than three pounds per item need not be considered.

(3)(i) Where it is expected that more than 33 percent of a carline, within an engine-system combination, will be equipped with an item (whether that item is standard equipment or an option) that can reasonably be expected to influence emissions, then such items shall actually be installed (unless excluded under paragraph (g)(3)(ii) of this section) on all emission-data and durability-data vehicles of that carline, within that engine-system combination, on which the items are intended to be offered in production. Items that can reasonably be expected to influence emissions are: air conditioning, power steering, power brakes, and other items determined by the Administrator.

(ii) If the manufacturer determines by test data or engineering evaluation that the actual installation of the optional equipment required by paragraph (g)(3)(i) of this section does not affect the emissions or fuel economy values, the optional equipment need not be installed on the test vehicle.

(iii) The weight of the options shall be included in the design curb weight and also be represented in the weight of the test vehicles.

(iv) The engineering evaluation, including any test data, used to support the deletion of optional equipment from test vehicles, shall be maintained by the manufacturer and shall be made available to the Administrator upon request.

(4) Where it is expected that 33 percent or less of a carline within an engine-system combination will be equipped with an item (whether that item is standard equipment or an option) that can reasonably be expected to influence emissions, that item shall not be installed on any emission-data vehicle or durability-data vehicle of that carline, within that engine-system combination, unless that item is standard equipment on that vehicle or specifically required by the Administrator.

(h) *Alternative Durability Program durability-data vehicles.* This section applies to light-duty vehicle and light-duty truck durability-data vehicles selected under the Alternative Durability Program described in § 86.085-13.

(1) To update the durability data to be used to determine a deterioration factor for each engine family group, the Administrator will select durability-data vehicles from the manufacturer's production line. Production vehicles will be selected from each model year's production for those vehicles certified using the Alternative Durability Program procedures.

(i) The Administrator shall select the production durability-data vehicle designs from the designs that the manufacturer offers for sale. For each model year and for each engine family group, the Administrator may select production durability-data vehicle designs of equal number to the number of engine families within the engine family group, up to a maximum of three vehicles.

(ii) The production durability-data vehicles representing the designs selected in paragraph (h)(1)(i) of this section will be randomly selected from the manufacturer's production. The Administrator will make these random selections unless the manufacturer (with prior approval of the Administrator) elects to make the random selections.

(iii) The manufacturer may select additional production durability-data vehicle designs from within the engine family group. The production durability-data vehicles representing these designs shall be randomly selected from the manufacturer's production in accordance with paragraph (h)(1)(ii) of this section.

(iv) For each production durability-data vehicle selected under paragraph (h)(1) of this section, the manufacturer shall provide to the Administrator (before the vehicle is tested or begins service accumulation) the vehicle identification number. Before the vehicle begins service accumulation the manufacturer shall also provide the Administrator with a description of the durability-data vehicle as specified by the Administrator.

(v) In lieu of testing a production durability-data vehicle selected under paragraph (h)(1) of this section, and submitting data therefrom, a manufacturer may, with the prior written approval of the Administrator, submit exhaust emission data from a production vehicle of the same configuration for which all applicable data has previously been submitted.

(2) If, within an existing engine family group, a manufacturer requests to certify vehicles of a new design, engine family, emission control system, or with any other durability-related design difference, the Administrator will determine if the existing engine family group deterioration factor is appropriate for the new design. If the Administrator cannot make this determination or deems the deterioration factor not appropriate, the Administrator shall select preproduction durability-data vehicles under the provisions of paragraph (c) of this section. If vehicles are then certified using the new design, the Administrator may select production vehicles with the new design under the provisions of paragraph (h)(1) of this section.

(3) If a manufacturer requests to certify vehicles of a new design that the Administrator determines are a new engine family group, the Administrator shall select preproduction durability-data vehicles under the provisions of paragraph (c) of this section. If vehicles are then certified using the new design, the Administrator may select production vehicles of that design under the provisions of paragraph (h)(1) of this section.

(Approved by the Office of Management and Budget under the control number 2060-0104)

[55 FR 7190, Feb. 28, 1990]

§ 86.092-26 Mileage and service accumulation; emission measurements.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles.

(2) The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV to this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 86.129, the manufacturer may elect to conduct the respect emission tests at higher loaded vehicle weight.

(3) *Emission-data vehicles.* Unless otherwise provided for in § 86.091-23(a), emission-data vehicles shall be operated and tested as follows:

(i) *Otto-cycle.* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. The manufacturer must accumulate a minimum of 2,000 miles (3,219 kilometers) on each test vehicle within an engine family. All test vehicle mileage must be accurately determined, recorded, and reported to the Administrator. Any vehicle used to represent emission-data vehicle selections under § 86.092-24(b)(1) shall be equipped with an engine and emission control system that has accumulated the mileage the manufacturer chose to accumulate on the test vehicle. Fuel economy data generated from certification vehicles selected in accordance with § 86.092-24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006-87(c). Complete exhaust and evaporative (if required) emission tests shall be conducted for each emission-data vehicle selection under § 86.092-24(b)(1). The Administrator may determine under § 86.092-24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.092-24(b)(1)(v) or (viii) shall be conducted at the mileage (2,000 mile minimum) at which the engine-system combination is stabilized for emission testing under high-altitude conditions.

(C) Exhaust and evaporative emissons tests for emission-data vehicle(s) selected for testing under § 86.092-24(b)(1) (i), (ii), (iii), (iv), or (vii)(B) shall be conducted at the mileage (2,000 mile mimimum) at which the engine-system combination is stabilized for emission testing under low-altitude conditions.

(D) For each engine family, the manufacturer will either select one vehicle previously selected under § 86.092-24(b)(1) (i) through (iv) to be tested under high-altitude conditions or provide a statement in accordance with § 86.092-24(b)(1)(v). Vehicles shall meet emission standards under both low- and high-altitude conditions without manual adjustments or modifications. In addition, any emission control device used to conform with the emission standards under high-altitude conditions shall initially actuate (automatically) no higher than 4,000 feet above sea level.

(ii) *Diesel.* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. The manufacturer must accumulate a minimum of 2,000 miles (3,219 kilometers) on each test vehicle within an engine family. All test vehicle mileage must be accurately determined, recorded, and reported to the Administrator. Any vehicle used to represent emission-data vehicle selections under § 86.092-24(b)(1) shall be equipped with an engine and emission control system that has accumulated the mileage the manufacturer chose to accumulate on the test vehicle. Fuel economy data generated from certification vehicles selected in accordance with § 86.092-24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006-87(c). Complete exhaust emission tests shall be conducted for each emission-data vehicle selection under § 86.092-24(b)(1). The Administrator may determine under § 86.092-24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.092-24(b)(1)(v) shall be conducted at the mileage (2,000 mile minimum) at which the engine-system combination is stabilized for emission testing under high-altitude conditions.

(C) Exhaust and evaporative emissons tests for emission-data vehicle(s) selected for testing under § 86.092-24(b)(1) (i), (ii), (iii), (iv), or (vii)(B) shall be conducted at the mileage (2,000 mile minimum) at which the engine-system combination is stabilized for emission testing under low-altitude conditions.

(D) For each engine family, the manufacturer will either select one vehicle previously selected under § 86.092-24(b)(1) (i) through (iv) to be tested under high-altitude conditions or provide a statement in accordance with § 86.092-24(b)(1)(v). Vehicles shall meet emission standards under both low- and high-altitude conditions without manual adjustments or modifications. In addition, any emission control device used to conform with the emission standards under high-altitude conditions shall initially actuate (automatically) no higher than 4,000 feet above sea level.

(4)(i) *Durability data vehicles.* (A) Unless otherwise provided for in § 86.091-23(a), each durability-data vehicle shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objective of this procedure.

(B) Complete exhaust emission tests shall be made at test point mileage intervals that the manufacturer determines.

(C) At a minimum, two complete exhaust emission tests shall be made. The first test shall be made at a distance not greater than 6,250 miles. The last shall be made at 50,000 miles.

(D) The mileage interval between test points must be of equal length except for the interval between zero miles and the first test, and any interval before or after testing conducted in conjunction with vehicle maintenance as specified in § 86.090-25(g)(2).

(ii) The manufacturer may, at its option, alter the durability-data vehicle at the selected test point to represent emission-data vehicle(s) within the same engine-system combination and perform emission tests on the altered vehicle. Upon completion of emission testing, the manufacturer may return the test vehicle to the durability-data vehicle configuration and continue mileage accumulation.

(5)(i) All tests required by this subpart on emission-data vehicles shall be conducted at a mileage equal to or greater than the mileage the manufacturer determines under paragraph (a)(3) of this section.

(ii) All tests required by this subpart on durability-data vehicles shall be conducted within 250 miles of each of the test points.

(6)(i)(A) The manufacturer may conduct multiple tests at any test point at which the data are intended to be used in the deterioration factor. At each test point where multiple tests are conducted, the test results from all valid tests shall be averaged to determine the data point to be used in the deterioration factor calculation, except under paragraph (a)(6)(i)(B) of this section. The test results from emission tests performed before maintenance affecting emissions shall not be averaged with test results after the maintenance.

(B) The manufacturer is not required to average multiple tests if the manufacturer conducts no more than three tests at each test point and if the number of tests at each test point is equal. All test points must be treated the same for all exhaust pollutants.

(ii) The results of all emission testing shall be supplied to the Administrator. The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) may be submitted weekly to the Administrator, but shall be air posted or delivered to the Administrator within 7 days after completion of the test. In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.091-23. Where the Administrator conducts a test on a durability-data vehicle at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(iii) The results of all emission tests shall be rounded, using the "Rounding Off Method" specified in ASTM E 29-67, to the number of places to the right of the decimal point indicated by expressing the applicable emission standard of this subpart to one additional significant figure.

(7) Whenever a manufacturer intends to operate and test a vehicle which may be used for emission or durability data, the manufacturer shall retain in its records all information concerning all emissions tests and maintenance, including vehicle alterations to represent other vehicle selections. For emission-data vehicles, this information shall be submitted, including the vehicle description and specification information required by the Administrator, to the Administrator following the emission-data test. For durability-data vehicles, this information shall be submitted following the 5,000-mile test.

(8) Once a manufacturer submits the information required in paragraphs (a)(7) of this section for a durability-data vehicle, the manufacturer shall continue to run the vehicle to 50,000 miles, and the data from the vehicle

will be used in the calculations under § 86.091-28. Discontinuation of a durability-data vehicle shall be allowed only with the consent of the Administrator.

(9)(i) The Administrator may elect to operate and test any test vehicle during all or any part of the mileage accumulation and testing procedure. In such cases, the manufacturer shall provide the vehicle(s) to the Administrator with all information necessary to conduct this testing.

(ii) The test procedures in §§ 86.106 through 86.145 will be followed by the Administrator. The Administrator will test the vehicles at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other vehicles of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(10) Emission testing of any type with respect to any certification vehicle other than that specified in this part is not allowed except as such testing may be specifically authorized by the Administrator.

(11) This section does not apply to testing conducted to meet the requirements of § 86.091-23(b)(2).

(b)(1) Paragraph (b) of this section applies to light-duty trucks.

(2) There are three types of mileage or service accumulation applicable to light-duty trucks:

(i) Mileage or service accumulation on vehicles, engines, subsystems, or components selected by the manufacturer under § 86.092-24(c)(2)(i). The manufacturer determines the form and extent of this mileage or service accumulation, consistent with good engineering practice, and describes it in the application for certification.

(ii) Mileage accumulation of the duration selected by the manufacturer on emission-data vehicles selected under § 86.092-24(b)(1). The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV to this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 86.129, the manufacturer may elect to conduct the respective emission tests at the test weight corresponding to the higher loaded vehicle weight.

(iii) Service or mileage accumulation which may be part of the test procedures used by the manufacturer to establish evaporative emission deterioration factors.

(3) Exhaust emission deterioration factors will be determined on the basis of the mileage or service accumulation described in paragraph (b)(2)(i) of this section and related testing, according to the manufacturer's procedures.

(4) Each emission-data vehicle shall be operated and tested as follows:

(i) *Otto-cycle.* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. The manufacturer must accumulate a minimum of 2,000 miles (3,219 kilometers) on each test vehicle within an engine family. All test vehicle mileage must be accurately determined, recorded, and reported to the Administrator. Any vehicle used to represent emission-data vehicle selections under § 86.092-24(b)(1) shall be equipped with an engine and emission control system that has accumulated the mileage the manufacturer chose to accumulate on the test vehicle. Fuel economy data generated from certification vehicles selected in accordance with § 86.092-24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006-87(c). Complete exhaust emission tests shall be conducted for each emission-data vehicle selection under § 86.092-24(b)(1). The Administrator may determine under § 86.092-24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.092-24 (b)(1)(v) or (b)(1)(viii) shall be conducted at the mileage (2,000 mile minimum) at which the engine-system combination is stabilized for emission testing or at 6,436 kilometers (4,000 miles) under high-altitude conditions.

(C) Exhaust and evaporative emission tests for emission-data vehicle(s) selected for testing under § 86.092-24(b)(1) (ii), (iii), (iv)(A), or (vii)(B) shall be conducted at the mileage (2,000 mile minimum) at which the engine-system combination is stabilized for emission testing or at 6,436 kilometer (4,000 mile) test point under low-altitude conditions.

(D) If the manufacturer recommends adjustments or modifications in order to conform to emission standards at high altitude, such adjustments or modifications shall be made to the test vehicle selected under § 86.092-24(b)(1) (v) and (viii) (in accordance with the instructions to be provided to the ultimate purchaser) before being tested under high-altitude conditions.

(ii) *Diesel.* (A) The manufacturer shall determine, for each engine family, the mileage at which the engine-system combination is stabilized for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested, a record of the rationale used in making this determination. The manufacturer may elect to accumulate 4,000 miles on each test vehicle within an engine family without making a determination. The manufacturer must accumulate a minimum of 2,000 miles (3,219 kilometers) on each test vehicle within an engine family. All test vehicle mileage must be accurately determined, recorded, and reported to the Administrator. Any vehicle used to represent emission-data vehicle selections under § 86.092-24(b)(1) shall be equipped with an engine and emission control system that has accumulated the mileage the manufacturer chose to accumulate on the test vehicle. Fuel economy data generated from certification vehicles selected in accordance with § 86.092-24(b)(1) with engine-system combinations that have accumulated more than 10,000 kilometers (6,200 miles) shall be factored in accordance with § 600.006-87(c). Complete exhaust emission tests shall be conducted for each emission-data vehicle selection under § 86.092-24(b)(1). The administrator may determine under § 86.092-24(f) that no testing is required.

(B) Emission tests for emission-data vehicle(s) selected for testing under § 86.092-24 (b)(1)(v) shall be conducted at the mileage (2,000 mile minimum) at which the engine-system combination is stabilized for emission testing or at the 6,436 kilometer (4,000 mile) test point under high-altitude conditions.

(C) Exhaust and evaporative emission tests for emission-data vehicle(s) selected for testing under § 86.092-24 (b)(1) (ii), (iii), and (iv) shall be conducted at the mileage (2,000 mile minimum) at which the engine-system combination is stabilized for emission testing or at the 6,436 kilometer (4,000 mile) test point under low-altitude conditions.

(D) If the manufacturer recommends adjustments or modifications in order to conform to emission standards at high-altitude, such adjustments or modifications shall be made to the test vehicle selected under § 86.092-24(b)(1) (v) and (viii) (in accordance with the instructions to be provided to the ultimate purchaser) before being tested under high-altitude conditions.

(iii) [Reserved]

(iv) All tests required by this subpart on emission-data vehicles shall be conducted at a mileage equal to or greater than the mileage the manufacturer determines under paragraph (b)(4) of this section.

(c)(1) Paragraph (c) of this section applies to heavy-duty engines.

(2) There are two types of service accumulation applicable to heavy-duty engines:

(i) Service accumulation on engines, subsystems, or components selected by the manufacturer under § 86.092-24(c)(3)(i). The manufacturer determines the form and extent of this service accumulation, consistent with good engineering practice, and describes it in the application for certification.

(ii) Dynamometer service accumulation on emission-data engines selected under § 86.092-24 (b)(2) or (b)(3). The manufacturer determines the engine operating schedule to be used for dynamometer service accumulation, consistent with good engineering practice. A single engine operating schedule shall be used for all engines in an engine family-control system combination. Operating schedules may be different for different combinations.

(3) Exhaust emission deterioration factors will be determined on the basis of the service accumulation described in paragraph (b)(2)(i) of this section and related testing, according to the manufacturer's procedures.

(4) The manufacturer shall determine, for each engine family, the number of hours at which the engine system combination is stabilized (no less than 62 hours for catalyst equipped) for emission-data testing. The manufacturer shall maintain, and provide to the Administrator if requested a record of the rationale used in making this determination. The manufacturer may elect to accumulate 125 hours on each test engine within an engine family without making a determination. Any engine used to represent emission-data engine selections under § 86.092-24(b)(2) shall be equipped with an engine system combination that has accumulated at least the number of hours determined under this paragraph. Complete exhaust emission tests shall be conducted for each emission-data engine selection under § 86.092-24(b)(2). Evaporative emission controls need not be connected provided normal operating conditions are maintained in the engine induction system. The Administrator may determine under § 86.092-24(f) that no testing is required.

(d)(1) Paragraph (d) of this section applies to both light-duty trucks and heavy-duty engines.

(2)(i) The results of all emission testing shall be supplied to the Administrator. The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) may be submitted weekly to the Administrator, but shall be air posted or delivered to the Administrator within 7 days after completion of the test. In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.092-23. Where the Administrator conducts a test on a durability-data vehicle at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be recorded and reported to the Administrator. These test results shall be rounded, in accordance with ASTM E 29-67, to the number of decimal places contained in the applicable emission standard expressed to one additional significant figure.

(3) Whenever a manufacturer intends to operate and test a vehicle (or engine) which may be used for emission data, the manufacturer shall retain in its records all information concerning all emissions tests and maintenance, including vehicle (or engine) alterations to represent other vehicle (or engine) selections. This information shall be submitted, including the vehicle (or engine) description and specification information required by the Administrator, to the Administrator following the emission-data test.

(4)-(5) [Reserved]

(6) Emission testing of any type with respect to any certification vehicle or engine other than that specified in this subpart is not allowed except as such testing may be specifically authorized by the Administrator.

(Approved by the Office of Management and Budget under the control number 2060-0104)

[55 FR 7194, Feb. 28, 1990]

§ 86.092–35 Labeling.

(a) The manufacturer of any motor vehicle (or motor vehicle engine) subject to the applicable emission standards (and family emission limits, as appropriate) of this subpart, shall, at the time of manufacture, affix a permanent legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles (or engines) available for sale to the public and covered by a certificate of conformity under § 86.091-30(a).

(1) *Light-duty vehicles.* (i) A permanent, legible label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches or liters), engine family identification and evaporative family identification;

(D) Engine tune-up specifications and adjustments, as recommended by the manufacutrer in accordance with the applicable emission standards (or family emission limits, as applicable), including but not limited to idle speeds(s), ignition timing, the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing and valve lash (as applicable), as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air conditioner), if any, should be in operation;

(E) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to light-duty vehicles;

(F) For vehicles which are part of the diesel particulate averaging program, the family particulate emission limit to which the vehicle is certified;

(G) For vehicles that have been exempted from compliance with the emission standards at high altitude, as specified in § 86.090-8(h):

(*1*) A highlighted statement (e.g., underscored or boldface letters) that the vehicle is certified to applicable emission standards at low altitude only;

(*2*) A statement that the vehicle's unsatisfactory performance under high-altitude conditions makes it unsuitable for principal use at high altitude, and

(*3*) A statement that the emission performance warranty provisions of 40 CFR part 85, subpart V do not apply when the vehicle is tested at high altitude; and

(H) For vehicles that have been exempted from compliance with the emission standards at low altitude, as specified in § 86.090-8(i):

(*1*) A highlighted statement (e.g., underscore or boldface letters) that the vehicle is certified to applicable emission standards at high altitude only; and

(*2*) A statement that the emission performance warranty provisions of 40 CFR part 85, subpart V do not apply when the vehicle is tested at low altitude.

(I) The vacuum hose routing diagram applicable to the vehicles if the vehicles are equipped with vacuum actuated emission and emission-related components. The manufacturer may, at its option, use a separate label for the vacuum hose routing diagram provided that the vacuum hose diagram is placed in a visible and accessible position as provided in this section.

(J) Vehicles granted final admission under § 85.1505 must comply with the labeling requirements contained in § 85.1510.

(2) *Light-duty truck and heavy-duty vehicles optionally certified in accordance with the light-duty truck provisions.* (i) A legible, permanent label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label.

(A) The label heading: Important Vehicle Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches or liters) and engine family identification;

(D) Engine tune-up specifications and adjustments, as recommended by the manufacturer in accordance with the applicable emission standards (or family emission limits, as appropriate), including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable), as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air conditioner), if any, should be in operation. If adjustments or modifications to the vehicle are necessary to insure compliance with emission standards (or family emission limits, as appropriate) at either high or low altitude, the manufacturer shall either include the instructions for such adjustments on the label, or indicate on the label where instructions for such adjustments may be found. The label shall indicate whether the engine tune-up or adjustment specifications are applicable to high altitude, low altitude, or both;

(E) (*1*) *Light-duty trucks.* One of the prominent statements, as applicable:

(*i*) Labels for light-duty trucks certified to the oxides of nitrogen standard of 1.12 grams per vehicle mile shall include the following statement: "This vehicle conforms to U.S. EPA regulations applicable to 19___ Model Year New Light-Duty Trucks."

(*ii*) Labels for light-duty trucks certified to the oxides of nitrogen standard of 1.7 grams per vehicle mile shall include the following statement: "This vehicle conforms to U.S. EPA regulations applicable to 19___ Model Year New Light-Duty Trucks with a curb weight greater than 3,450 pounds."

(*2*) *Heavy-duty vehicles optionally certified in accordance with the lighduty truck provisions.* "This heavy-duty vehicle conforms to the U.S. EPA regulations applicable to 19___ Model Year Light-Duty Trucks under the special provision of 40 CFR 86.092-1(b)."

(F) If the manufactuer is provided an alternate useful life period under the provisions of § 86.091-21(f), the prominent statement: "This vehicle has been certified to meet U.S. EPA standards for a useful-life period of ___ years or ___ miles of operation, whichever occurs first. This vehicle's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than years or miles (e.g., hours, or miles only).

(G) A statement, if applicable, that the adjustments or modifications indicated on the lable are necessary to ensure emission control compliance at the altitude specified.

(H) A statement, if applicable, that the high-altitude vehicle was designated or modified for principal use at high altitude. This statement must be affixed by the manufacturer at the time of assembly or by any dealer who performs the high-altitude modification or adjustment prior to sale to an ultimate purchaser.

(I) For vehicles that have been exempted from compliance with the high-altitude emission standards, as specified in § 86.091-9(g)(2).

(*1*) A highlighted statement (e.g., underscored or boldface letters) that the vehicle is certified to applicable emission standards at low altitude only.

(*2*) A statement that the vehicle's unsatisfactory performance under high-altitude conditions makes it unsuitable for principal use at high altitude, and

(*3*) A statement that the emission performance warranty provisions of 40 CFR Part 85, Subpart V do not apply when the vehicle is tested at high altitude:

(J) For vehicles which are included in the diesel particulate averaging program, the family particulate emission limit to which the vehicle is certified.

(K) For vehicles which are included in the light-duty truck NO_x averaging program, the family NO_x emissions limit to which the vehicle is certified.

(L) The vacuum hose routing diagram applicable to the vehicles if the vehicles are equipped with vacuum actuated emission and emission-related components. The manufacturer may, at its option, use a separate label for the vacuum hose routing diagram provided that the vacuum hose diagram is placed in a visible and accessible position as provided by this section.

(M) Vehicles granted final admission under § 85.1505 must comply with the labeling requirements contained in § 85.1510.

(3) *Heavy-duty engines.* (i) A permanent legible label shall be affixed to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Important Engine Information.

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches or liters) and engine family and model designations;

(D) Date of engine manufacture (month and year). The manufacturer may, in lieu of including the date of manufacture on the engine label, maintain a record of the engine manufacture dates. The manufacturer shall provide the date of manufacture records to the Administrator upon request.

(E) Engine specifications and adjustments as recommended by the manufacturer. These specifications should indicate the proper transmission position during tune-up and what accessories (e.g., air conditioner), if any, should be in operation;

(F) For Otto-cycle engines the label should include the idle speed, ignition timing, and the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), and valve lash;

(G) For diesel engines the label should include the advertised hp at rpm, fuel rate at advertised hp in mm^3/stroke, valve lash, initial injection timing, and idle speed;

(H) The prominent statement: "This engine conforms to U.S. EPA regulations applicable to 19___ Model Year New Heavy-Duty Engines."

(I) If the manufacturer is provided with an alternate useful life period under the provisions of § 86.901-21(f), the prominent statement: "This engine has been certified to meet U.S. EPA standards for a useful-life period of ____ miles or ____ hours of operation, whichever occurs first. This engine's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than miles or hours (e.g., years, or hours only).

(J) *For diesel engines.* The prominent statement: "This engine has a primary intended service application as a ____ heavy-duty engine." (The primary intended service applications are light, medium, and heavy, as defined in § 86.902-2.)

(K) *For Otto-cycle engines.* One of the following statements, as applicable:

(*1*) For engines certified to the emission standards under § 86.091-10 (a)(1)(i) or (iii), the statement: "This engine is certified for use in all heavy-duty vehicles."

(*2*) for gasoline-fueled engines certified under the provisions of § 86.091-10(a)(3)(i), the statement: "This engine is certified for use in all heavy-duty vehicles under the special provision of 40 CFR § 86.091-10(a)(3)(i)."

(*3*) For engines certified to the emission standards under § 86.091-10 (a)(1)(ii) or (iv), the statement: "This engine is certified for use only in heavy-duty vehicles with a gross vehicle weight rating above 14,000 lbs."

(L) For diesel engines which are included in the diesel heavy-duty particulate averaging program, the family particulate emission limit to which the engine is certified.

(M) For any heavy-duty engines which are included in the heavy-duty NO_x averaging program, the family NO_x emission limit to which the engine is certified.

(N) Engines granted final admission under § 85.1505 must comply with the labeling requirements contained in § 85.1510.

(iv) The label may be made up of one or more pieces: *Provided*, That all pieces are permanently attached to the same engine or vehicle part as applicable.

(4)(i) *Gasoline-fueled and methanol-fueled heavy-duty vehicles.* A permanent, legible label shall be affixed in a readily visible position in the engine compartment. If such vehicles do not have an engine compartment, the label required in paragraphs (a)(4) and (g)(1) of this section shall be affixed in a readily visible position on the operator's enclosure or on the engine.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Evaporative family identification;

(D) The maximum nominal fuel tank capacity (in gallons) for which the evaporative control system is certified; and,

(E) One of the following, as appropriate:

(*1*) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to gasoline-fueled heavy-duty vehicles.

(*2*) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to methanol-fueled heavy-duty vehicles.

(F) Vehicles granted final admission under § 85.1505 must comply with the labeling requirements contained in § 85.1510.

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle (or engine) conforms to any applicable state emission standards for new motor vehicles (or new motor vehicle engines) or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the vehicle (or engine).

(c)(1) The manufacturer of any light-duty vehicle or light-duty truck subject to the emission standards (or family emission limits, as appropriate) of this subpart shall, in addition and subsequent to setting forth those statements on the label required by the Department of Transportation (DOT) pursuant to 49 CFR 567.4, set forth on the DOT label or an additional label located in proximity to the DOT label and affixed as described in 40 CFR 567.4(b), the following information in the English language, lettered in block letters and numerals not less than three thirty-seconds of an inch high, of a color that contrasts with the background of the label:

(i) The heading: "Vehicle Emission Control Information."

(ii)(A) *For light-duty vehicles,* The statement: "This Vehicle Conforms to

U.S. EPA Regulations Applicable to 19___ Model Year New Motor Vehicles."

(B) *For light-duty trucks.* (*1*) The statement: "This vehicle conforms to U.S. EPA regulations applicable to 19___ Model Year New Light-Duty Trucks."

(*2*) If the manufacturer is provided an alternate useful life period under the provisions of § 86.091-21(f), the prominent statement: "This vehicle has been certified to meet U.S. EPA standards for a useful-life period of ___ years or ___ miles of operation, whichever occurs first. This vehicle's actual life may vary depending on its service application." The manufacturer may alter this statement only to express the assigned alternate useful life in terms other than years or miles (e.g., hours, or miles only)

(iii) One of the following statements, as applicable, in letters and numerals not less than six thirty-seconds of an inch high and of a color that contrasts with the background of the label:

(A) For all vehicles certified as non-catalyst-equipped: "NON-CATALYST"

(B) For all vehicles certified as catalyst-equipped which are included in a manufacturer's catalyst control program for which approval has been given by the Administrator: "CATALYST—APPROVED FOR IMPORT"

(C) For all vehicles certified as catalyst-equipped which are not included in a manufacturer's catalyst control program for which prior approval has been given by the Administrator: "CATALYST"

(2) In lieu of selecting either of the labeling options of paragraph (c)(1) of this section, the manufacturer may add the information required by paragraph (c)(1)(iii) of this section to the label required by paragraph (a) of this section. The required information will be set forth in the manner prescribed by paragraph (c)(1)(iii) of this section.

(d) Incomplete light-duty trucks or incomplete heavy-duty vehicles optionally certified in accordance with the light-duty truck provisions shall have one of the following prominent statements, as applicable, printed on the label required by paragraph (a)(2) of this section in lieu of the statement required by paragraph (a)(2)(iii)(E) of this section.

(1) *Light-duty trucks.* (i) Labels for light-duty trucks certified to the oxides of nitrogen standard of 1.2 grams per vehicle mile shall include the following statement: "This vehicle conforms to U.S. EPA regulations applicable to 19___ Model Year New Light-Duty Trucks when it does not exceed ___ pounds in curb weight, ___ pounds in gross vehicle weight rating, and ___ square feet in frontal area."

(ii) Labels for light-duty trucks certified to the oxides of nitrogen standards of 1.7 grams per vehicle mile shall include the following statement: "This vehicle conforms to U.S. EPA regulations applicable to 19___ Model Year New Light-Duty Trucks when it is between 3,450 pounds and ___ pounds in curb weight and it does not exceed ___ pounds in gross vehicle weight rating nor ___ square feet in frontal area."

(2) *Heavy-duty vehicles optionally certified in accordance with the light-duty truck provisions.* "This heavy-duty vehicle conforms to the U.S. EPA regulations applicable to 19___ Model Year Light-Duty Trucks under the special provision of 40 CFR 86.085-1(b) when it does not exceed ___ pounds in curb weight, ___ pounds in gross vehicle weight rating, and ___ square feet in frontal area."

(e) Incomplete heavy-duty vehicles having a gross vehicle weight rating of 8,500 pounds or less shall have one of the following statements printed on the label required by paragraph (a)(3) of this section in lieu of the statement required by paragraph (a)(3)(iii)(H) of this section: "This engine conforms to U.S. EPA regulations applicable to 19___ Model Year Heavy-Duty Engines when installed in a vehicle completed at a curb weight of more than 6,000 pounds or with a frontal area of greater than 45 square feet."

(f) The manufacturer of any incomplete light-duty vehicle or light-duty truck shall notify the purchaser of such vehicle of any curb weight, frontal area, or gross vehicle weight rating limitations affecting the emission certificate applicable to that vehicle. This notification shall be transmitted in a manner consistent with National

Highway Traffic Safety Administration safety notification requirements published in 49 CFR part 568.

(g)(1)(i) Incomplete gasoline-fueled heavy-duty vehicles shall have the following prominent statement printed on the label required in paragraph (a)(4) of this section: "(Manufacturer's corporate name) has determined that this vehicle conforms to U.S. EPA regulations applicable to 19____ Model Year New Gasoline-Fueled Heavy-Duty Vehicles when completed with a nominal fuel tank capacity not to exceed _____ gallons. Persons wishing to add fuel tank capacity beyond the above maximum must submit a written statement to the Administrator that the hydrocarbon storage system has been upgraded according to the requirements of 40 CFR 86.092-35(g)(2)."

(ii) Incomplete methanol-fueled heavy-duty vehicles shall have the following prominent statement printed on the label required in paragraph (a)(4) of this section: "(Manufacturer's corporate name) has determined that this vehicle conforms to U.S. EPA regulations applicable to 19____ Model Year New Methanol-Fueled Heavy-Duty Vehicles when completed with a nominal fuel tank capacity not to exceed _____ gallons. Persons wishing to add fuel tank capacity beyond the above maximum must submit a written statement to the Administrator that the hydrocarbon storage system has been upgraded according to the requirements of 40 CFR 86.091-35(g)(2)."

(2) Persons wishing to add fuel tank capacity beyond the maximum specified on the label required in paragraph (g)(1) of this section shall:

(i) Increase the amount of fuel tank vapor storage material according to the following function:

$$\text{Cap}_f = \text{Cap}_i \left(\frac{\text{T. Vol.}}{\text{Max. Vol.}} \right)$$

Where:

Cap_f = final amount of fuel tank vapor storage material, grams.

Cap_i = initial amount of fuel tank vapor storage material, grams.

T. Vol. = total fuel tank volume of completed vehicle, gallons.

Max. Vol. = maximum fuel tank volume as specified on the label required in paragraph (g)(1) of this section, gallons.

(ii) Use, if applicable, hosing for fuel vapor routing which is at least as impermeable to hydrocarbon vapors as that used by the primary manufacturer.

(iii) Use vapor storage material with the same absorptive characteristics as that used by the primary manufacturer.

(iv) Connect, if applicable, any new hydrocarbon storage device to the existing hydrocarbon storage device in series such that the original hydrocarbon storage device is situated between the fuel tank and the new hydrocarbon storage device. The original hydrocarbon storage device shall be sealed such that vapors cannot reach the atmosphere. The elevation of the original hydrocarbon storage device shall be equal to or lower than the new hydrocarbon storage device.

(v) Submit a written statement to the Administrator that paragraphs (g)(2)(i) through (g)(2)(iv) of this section have been complied with.

(3) If applicable, the Administrator will send a return letter verifying the receipt of the written statement required in paragraph (g)(2)(v) of this section.

(h)(1) Light-duty trucks and heavy-duty vehicles and engines for which nonconformance penalties are to be paid in accordance with § 86.1113-87(b) shall have the following information printed on the label required in paragraph (a) of this section. The manufacturer shall begin labeling production engines or vehicles within 10 days after the completion of the PCA.

(i) The statement: "The manufacturer of this engine/vehicle will pay a nonconformance penalty to be allowed to introduce it into commerce at an emission level higher than the applicable emission standard. The compliance level (or new emission standard) for this engine/vehicle is _____." (The manufacturer shall insert the applicable pollutant and compliance level calculated in accordance with § 86.1112-87(a).)

(2) If a manufacturer introduces an engine or vehicle into commerce prior to the compliance level determination of § 86.1112-87(a), it shall provide the engine or vehicle owner with a label as described above to be affixed in a location in proximity to the label required in paragraph (a) of this section within 30 days of the completion of the PCA.

(Approved by the Office of Management and Budget under the control number 2060-0104)

[55 FR 7197, Feb. 28, 1990]

§ 86.094–11 Emission standards for 1994 and later model year diesel heavy-duty engines.

(a)(1) Exhaust emissions from new 1994 and later model year diesel heavy-duty engines shall not exceed the following:

(i)(A) *Hydrocarbons (for petroleum-fueled diesel engines).* 1.3 grams per brake horsepower-hour (0.48 gram per megajoule), as measured under transient operating conditions.

(B) *Organic Material Hydrocarbon Equivalent (for methanol-fueled diesel engines).* 1.3 grams per brake horsepower-hour (0.48 gram per megajoule), as measured under transient operating conditions.

(ii) *Carbon monoxide.* (A) 15.5 grams per brake horsepower-hour (5.77 grams per megajoule), as measured under transient operating conditions.

(B) 0.50 percent of exhaust gas flow at curb idle (methanol-fueled diesel only).

(iii) *Oxides of nitrogen.* [Reserved]

(iv) *Particulate.* (A) 0.10 grams per brake horsepower-hour (0.037 gram per megajoule), as measured under transient operating conditions.

(B) A manufacturer may elect to include all or some of its diesel heavy-duty engine families, exclusive of engines to be used in urban buses, in the appropriate heavy-duty particulate averaging program (petroleum or methanol), provided that engines produced for sale in California or in 49-state areas may be averaged only within each of those areas. Averaging is not permitted between fuel types. Engines for use in urban buses may not be included in either heavy-duty particulate averaging program. Averaging is limited to engines within a given primary service class as defined in § 86.085-2. Averaging across primary service classes is not permitted. If the manufacturer elects to participate in either averaging program, individual family particulate limits may not exceed 0.60 grams per brake horsepower-hour (0.22 gram per megajoule).

(b)(1) The opacity of smoke emission from new 1994 and later model year diesel heavy-duty engines shall not exceed:

(i) 20 percent during the engine acceleration mode.

(ii) 15 percent during the engine lugging mode.

(iii) 50 percent during the peaks in either mode.

(2) The standards set forth in paragraph (b)(1) of this section refer to exhaust smoke emissions generated under the conditions set forth in Subpart I of this part and measured and calculated in accordance with those procedures.

(3) *Evaporative emissions* (total of non-oxygenated hydrocarbons plus methanol) from 1994 and later model year heavy-duty vehicles equipped with methanol-fueled diesel engines shall not exceed:

(i) For vehicles with a Gross Vehicle Weight Rating of up to 14,000 lbs, 3.0 grams per test.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 14,000 lbs, 4.0 grams per test.

(4)(i) For vehicles with a Gross Vehicle Weight Rating of up to 26,000 lbs, the standards set forth in paragraph (b)(3) of this section refer to a composite sample of evaporative emissions collected under the conditions set forth in Subpart M and measured in accordance with those procedures.

(ii) For vehicles with a Gross Vehicle Weight Rating of greater than 26,000 lbs, the standard set forth in paragraph (b)(3)(ii) of this section refers to the manufacturers, engineering design evaluation using good engineering practice (a statement of which is required in § 86.091 23(b)(4)(ii)).

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1994 or later model year methanol-fueled diesel, or any naturally-aspirated diesel heavy-duty engine. For petroleum-fueled engines only, this provision does not apply to engines using turbochargers, pumps, blowers, or superchargers for air induction.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subpart I or N of this part to ascertain that such test engines meet the requirements of paragraphs (a), (b), and (c) and (d) of this section.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10654, Mar. 15, 1985, as amended at 54 FR 14466, Apr. 11, 1989]

Subpart B—Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles and New Light-Duty Trucks; Test Procedures

SOURCE: 42 FR 32954, June 28, 1977, unless otherwise noted.

§ 86.101 General applicability.

(a) The provisions of this subpart are applicable to 1977 and later model year new light-duty vehicles and light-duty trucks.

(1) Sections 86.101 through 86.145-78 apply for 1978 and later model years.

(2) Sections 86.177-4 through 86.177-23 apply for the 1977 model year only.

(b) Provisions of this subpart apply to tests performed by both the Administrator and motor vehicle manufacturers.

§ 86.102 Definitions.

The definitions in Subpart A apply to this subpart.

[45 FR 14508, Mar. 5, 1980]

§ 86.103 Abbreviations.

The abbreviations in Subpart A apply to this subpart.

[45 FR 14508, Mar. 5, 1980]

§ 86.104 Section numbering; construction.

(a) The model year of initial applicability is indicated by the section number. The two digits following the hyphen designate the first model year for which a section is effective. A section remains effective until superseded.

Example. Section 86.111-78 applies to the 1978 and subsequent model years until superseded. If a § 86.111-81 is promulgated it would take effect beginning with the 1981 model year; § 86.111-78 would apply to model years 1978 through 1980.

(b) Unless indicated otherwise, all provisions in this subpart apply to petroleum-fueled and methanol-fueled vehicles.

[42 FR 32954, June 28, 1977. Redesignated at 45 FR 14508, Mar. 5, 1980, as amended at 54 FR 14499, Apr. 11, 1989]

§ 86.105 Introduction; structure of subpart.

(a) This subpart describes the equipment required and the procedures to follow in order to perform gaseous exhaust, diesel particulate, and evaporative emission tests on light-duty vehicles and light-duty trucks. Subpart A sets forth testing requirements and test intervals necessary to comply with EPA certification procedures.

(b) Three topics are addressed in this subpart. Sections 86.106 through 86.115 set forth specifications and equipment requirements; §§ 86.116 through 86.126 discuss calibration methods and frequency; test procedures and data requirements are listed (in approximate order of performance) in §§ 86.127 through 86.145.

[42 FR 32954, June 28, 1977. Redesignated and amended at 45 FR 14508, Mar. 5, 1980; 54 FR 14499, Apr. 11, 1989]

§ 86.106-82 Equipment required; overview.

(a) This subpart contains procedures for exhaust emissions tests on light-duty diesel vehicles and light-duty diesel trucks, and exhaust and evaporative emission tests on gasoline-fueled light-duty vehicles and light-duty trucks. Certain items of equipment are not necessary for a particular test, e.g., evaporative enclosure when testing diesel vehicles. Equipment required and specifications are as follows:

(1) *Evaporative emission tests, gasoline-fueled vehicles.* The evaporative emission test is closely related to and connected with the exhaust emission test. All vehicles tested for evaporative emissions must be tested for exhaust emissions. Further, unless the evaporative emission test is waived by the Administrator under § 86.078-26, all gasoline-fueled vehicles must undergo both tests. (Diesel vehicles are excluded from the evaporative emission standard.) Section 86.107 specifies the necessary equipment.

(2) *Exhaust emission tests.* All vehicles subject to this subpart are tested for exhaust emissions. The exhaust from gasoline-fueled vehicles is tested for gaseous emissions only, using the CVS concept (§ 86.109). The exhaust from diesel vehicles is tested for both gaseous and particulate emissions. Diesel testing also utilizes the CVS concept of measuring emissions, but requires that a PDP-CVS or CFV with heat exchanger be used, and that it be connected to a dilution tunnel in order to sample particulate emissions (§ 86.110). All gasoline-fueled vehicles are either tested for evaporative emissions or undergo a diurnal heat build. Diesel vehicles are excluded from this requirement. Equipment necessary and specifications appear in §§ 86.108 through 86.114.

(3) *Fuel, analytical gas, and driving schedule specifications.* Fuel specifications for exhaust and evaporative emissions testing and for mileage accumulation for gasoline-fueled and diesel vehicles are specified in § 86.113. Analytical gases are specified in § 86.114. The EPA Urban Dynamometer Driving Schedule (UDDS) for use in both gasoline-fueled and diesel exhaust emissions tests is specified in § 86.115 and Appendix I.

[45 FR 14508, Mar. 5, 1980]

§ 86.106-90 Equipment required; overview.

(a) This subpart contains procedures for exhaust emissions tests on petroleum-fueled, and methanol-fueled light-duty vehicles and light-duty trucks, and for evaporative emission tests on gasoline-fueled and methanol-fueled light-duty vehicles and light-duty trucks. Certain items of equipment are not necessary for a particular test, *e.g.*, evaporative enclosure when testing diesel vehicles. Alternate sampling systems may be used if shown to yield equivalent results, and if approved in advance by the Administrator. Equipment required and specifications are as follows:

(1) *Evaporative emission tests, gasoline-fueled and methanol-fueled vehicles.* The evaporative emission test is closely related to and connected with the exhaust emission test. All vehicles tested for evaporative emissions must be tested for exhaust emissions. Further, unless the evaporative emission test is waived by the Administrator under § 86.090-26, all gasoline-fueled and methanol-fueled vehicles must undergo both tests. (Diesel vehicles are excluded from the evaporative emission standard.) Section 86.107 specifies the necessary equipment.

(2) *Exhaust emission tests.* All vehicles subject to this subpart are tested for exhaust emissions. The exhaust from Otto-cycle vehicles is tested for gaseous emissions only, using the CVS concept (§ 86.109). The exhaust from diesel vehicles is tested for both gaseous and particulate emissions. Petroleum-fueled diesel vehicle testing also utilizes the CVS concept of measuring emissions, but requires that a PDP-CVS or CFV with heat exchanger be used, and that it be connected to a dilution tunnel in order to sample particulate emissions (§ 86.110). The exhaust from methanol-fueled diesel vehicles is tested for both gaseous and particulate emissions using the CVS concept (either PDP CVS or CFV as specified in § 86.109 or PDP-CVS or CFV with heat exchanger as specified in § 86.110 may be used) and is connected to a dilution tunnel to sample particulate emissions (§ 86.110) (This equipment may be used with methanol-fueled Otto-cycle vehicles, however, particulates are not measured). All gasoline-fueled and methanol-fueled vehicles are either tested for evaporative emissions or undergo a diurnal heat build. Petroleum-fueled diesel ve-

hicles are excluded from this requirement. Equipment necessary and specifications appear in §§ 86.108 through 86.114.

(3) *Fuel, analytical gas, and driving schedule specifications.* Fuel specifications for exhaust and evaporative emissions testing and for mileage accumulation for petroleum-fueled and methanol-fueled vehicles are specified in § 86.113. Analytical gases are specified in § 86.114. The EPA Urban Dynamometer Driving Schedule (UDDS) for use in petroleum-fueled and methanol-fueled exhaust emissions tests is specified in § 86.115 and Appendix I.

[54 FR 14499, Apr. 11, 1989]

§ 86.107-78 Sampling and analytical system; evaporative emissions.

(a) Component description (evaporative emissions sampling system). The following components will be used in evaporative emissions sampling systems for testing under this subpart.

(1) *Evaporative emission measurement enclosure.* The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.117. Interior surfaces must be impermeable to hydrocarbons. One surface should be of flexible, impermeable material to allow for minor volume changes, resulting from temperature changes. Wall design should promote maximum dissipation of heat, and if artificial cooling is used, interior surface temperatures shall not be less than 68° F (20° C).

(2) *Evaporative emission hydrocarbon analyzers.* A hydrocarbon analyzer utilizing the hydrogen flame ionization principle (FID) shall be used to monitor the atmosphere within the enclosure. Instrument bypass flow may be returned to the enclosure. The FID shall have a response time to 90 percent of final reading of less than 1.5 seconds, and be capable of meeting performance requirements expressed as a function of C_{std}: where C_{std} is the specific enclosure hydrocarbon level, in ppm, corresponding to the evaporative emission standard:

(i) Stability of the analyzer shall be better than 0.01 C_{std} ppm at zero and span over a 15-minute period on all ranges used.

(ii) Repeatability of the analyzer, expressed as one standard deviation, shall be better than 0.005 C_{std} ppm on all ranges used.

(3) *Evaporative emission hydrocarbon data recording system.* The electrical output of the FID shall be recorded at least at the initiation and termination of each diurnal or hot soak. The recording may be by means of a strip chart potentiometric recorder, by use of an on-line computer system or other suitable means. In any case, the recording system must have operational characteristics (signal to noise ratio, speed of response, etc.) equivalent to or better than those of the signal source being recorded, and must provide a permanent record of results. The record shall show a positive indication of the initiation and completion of each diurnal or hot soak along with the time elapsed between initiation and completion of each soak.

(4) *Tank fuel heating system.* The tank fuel heating system shall consist of a heat source and a temperature controller. A typical heat source is a 2000 W heating pad. Other sources may be used as required by circumstances. The temperature controller may be manual, such as a variable voltage transformer, or may be automated. The heating system must not cause hot spots on the tank wetted surface which could cause local overheating of the fuel. Heat must not be applied to the vapor in the tank above the liquid fuel. The temperature controller must be capable of controlling the fuel tank temperature during the diurnal soak to within ±3° F (1.7° C) of the following equation:

$$F=T_o+0.4t$$

or for SI units:

$$C=T_o+(2/9)t$$

where:

F = Temperature in °F

C = Temperature in °C

t = Time since start of test in minutes

T_o = Initial temperature

(5) *Temperature recording system.* Strip chart recorder(s) or automatic data processor shall be used to record enclosure ambient and vehicle fuel

tank temperature during the evaporative emissions test. The temperature recorder or data processor shall record each temperature at least once every minute. The recording system shall be capable of resolving time to ±15s and capable of resolving temperature to ±0.75° F. (0.42° C). The temperature recording system (recorder and sensor) shall have an accuracy of ±3° F (1.7° C). The recorder (data processor) shall have a time accuracy of ±15s and a precision of ±15s. Two ambient temperature sensors, connected to provide one average output, shall be located in the enclosure. These sensors shall be located at the approximate vertical centerline of each side wall extending 4 inches (nominally) into the enclosure at a height of 3±0.5 ft (0.9±0.2 m). The vehicle fuel tank temperature sensor shall be located in the fuel tank so as to measure the temperature of the prescribed test fuel at the approximate mid-volume of the fuel. Manufacturers shall arrange that vehicles furnished for testing at Federal certification facilities be equipped with iron-constantan Type J thermocouples for measurement of fuel tank temperature.

(6) *Purge blower.* One or more portable or fixed blowers shall be used to purge the enclosure. The blowers shall have sufficient flow capacity to reduce the enclosure hydrocarbon concentration from the test level to the ambient level between tests. Actual flow capacity will depend upon the time available between tests.

(7) *Mixing blower.* One or more small blowers or fans with a total capacity of 200 to 1,000 cfm shall be used to mix the contents of the enclosure during evaporative emission testing. No portion of the air stream shall be directed towards the vehicle. Maintenance of uniform concentrations throughout the enclosure is important to the accuracy of the test.

§ 86.107-90 Sampling and analytical system; evaporative emissions.

(a) Component description (evaporative emissions sampling system). The following components will be used in evaporative emissions sampling systems for testing under this subpart.

(1) *Evaporative emission measurement enclosure.* The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.117. Interior surfaces must be impermeable and non-reactive to hydrocarbons and to methanol (if the enclosure is used for methanol-fueled vehicles). One surface should be of flexible, impermeable and non-reactive material to allow for minor volume changes, resulting from temperature changes. Wall design should promote maximum dissipation of heat, and if artificial cooling is used, interior surface temperatures shall not be less than 68°F (20°C).

(2) *Evaporative emission hydrocarbon and methanol analyzers.* (i) For gasoline- and methanol-fueled vehicles a hydrocarbon analyzer utilizing the hydrogen flame ionization principle (FID) shall be used to monitor the atmosphere within the enclosure (a heated FID (HFID)(235°±15°F (113±8°C)) is required for methanol-fueled vehicles). Instrument bypass flow may be returned to the enclosure. The FID shall have a response time to 90 percent of final reading of less than 1.5 seconds, and be capable of meeting performance requirements expressed as a function of Cstd: where Cstd is the specific enclosure hydrocarbon level, in ppm, corresponding to the evaporative emission standard:

(A) Stability of the analyzer shall be better than 0.01 Cstd ppm at zero and span over a 15-minute period on all ranges used.

(B) Repeatability of the analyzer, expressed as one standard deviation, shall be better than 0.005 Cstd ppm on all ranges used.

(ii) For methanol-fueled vehicles, a methanol sampling and analyzing system is required in addition to the FID analyzer. The methanol sampling equipment shall consist of impingers for collecting the methanol sample and appropriate equipment for drawing the sample through the impingers. The analytical equipment shall consist of a gas chromatograph equipped with a flame ionization detector. (NOTE: For 1990 through 1994 model year methanol-fueled vehicles, a HFID calibrated on methanol may be used in place of the HFID, calibrated on propane plus the methanol impingers and associated analytical equipment).

(3) *Evaporative emission hydrocarbon and methanol data recording system.* (i) The electrical output of the FID used for measuring hydrocarbons (or hydrocarbons plus methanol as appropriate) shall be recorded at least at the initiation and termination of each diurnal or hot soak. The recording may be by means of a strip chart potentiometric recorder, by use of an online computer system or other suitable means. In any case, the recording system must have operational characteristics (signal to noise ratio, speed of response, *etc.*) equivalent to or better than those of the signal source being recorded, and must provide a permanent record of results. The record shall show a positive indication of the initiation and completion of each diurnal or hot soak along with the time elapsed between initiation and completion of each soak.

(ii) For the methanol sample, permanent records shall be made of the following: the volumes of deionized water introduced into each impinger, the rate and time of sample collection, the volumes of each sample introduced into the gas chromatograph, the flow rate of carrier gas through the column, the column temperature, and the chromatogram of the analyzed sample.

(4) *Tank fuel heating system.* The tank fuel heating system shall consist of a heat source and a temperature controller. A typical heat source is a 2000 W heating pad. Other sources may be used as required by circumstances. The temperature controller may be manual, such as a variable voltage transformer, or may be automated. The heating system must not cause hot spots on the tank wetted surface which could cause local overheating of the fuel. Heat must not be applied to the vapor in the tank above the liquid fuel. The temperature controller must be capable of controlling the fuel tank temperature during the diurnal soak to within ±3°F (±1.7°C) of the following equation:

$F=T_o+(0.4)t.$

or *For SI units:*

$C=T_o+(2/9)t.$

Where:

F = Temperature in °F.

C = Temperature in °C.

t = Time since start of test in minutes.

T_o = initial temperature in °F (or in °C for SI units).

(5) *Temperature recording system.* Strip chart recorder(s) or automatic data processor shall be used to record enclosure ambient and vehicle fuel tank temperature during the evaporative emissions test. The temperature recorder or data processor shall record each temperature at least once every minute. The recording system shall be capable of resolving time to ±15s and capable of resolving temperature to ±0.75°F (±0.42°C). The temperature recording system (recorder and sensor) shall have an accuracy of ±3°F (±1.7°C). The recorder (data processor) shall have a time accuracy of ±15s and a precision of ±15s. Two ambient temperature sensors, connected to provide one average output, shall be located in the enclosure. These sensors shall be located at the approximate vertical centerline of each side wall extending 4 inches (nominally) into the enclosure at a height of 3±0.5 ft (0.9±0.2m). The vehicle fuel tank temperature sensor shall be located in the fuel tank so as to measure the temperature of the prescribed test fuel at the approximate mid-volume of the fuel. Manufacturers shall arrange that vehicles furnished for testing at Federal certification facilities be equipped with iron-constantan Type J thermocouples for measurement of fuel tank temperature.

(6) *Purge blower.* One or more portable or fixed blowers shall be used to purge the enclosure. The blowers shall have sufficient flow capacity to reduce the enclosure hydrocarbon and/or methanol concentration from the test level to the ambient level between tests. Actual flow capacity will depend upon the time available between tests.

(7) *Mixing blower.* One or more small blowers or fans with a total capacity of 200 to 1000 cfm shall be used to mix the contents of the enclosure

during evaporative emission testing. No portion of the air stream shall be directed toward the vehicle. Maintenance of uniform concentrations throughout the enclosure is important to the accuracy of the test.

[54 FR 14499, Apr. 11, 1989]

§ 86.108–79 Dynamometer.

(a) The dynamometer shall have a power absorption unit for simulation of road load power and flywheels or other means of simulating the inertia weight as specified in § 86.129.

(b) (1) The dynamometer shall have a roll or shaft revolution counter for determination of distance driven.

(2) In lieu of the requirement in (b)(1) of this section the manufacturer shall provide some means, approved in advance by the Administrator, for the determination of distance driven.

(c) Small twin-roll dynamometers shall have a nominal roll diameter of 8.65 inches and a nominal roll spacing of 17 inches. Large single-roll dynamometers shall have a nominal roll diameter of 48 inches. Dynamometers with other roll specifications may be used if the total simulated road load power can be shown to be equivalent, and if approved in advance by the Administrator.

[42 FR 45651, Sept. 12, 1977]

§ 86.109–82 Exhaust gas sampling system; gasoline-fueled vehicles.

(a)(1) *General.* The exhaust gas sampling system described in this paragraph is designed to measure the true mass of gaseous emissions in the exhaust of gasoline-fueled vehicles. In the CVS concept of measuring mass emissions, two conditions must be satisfied; the total volume of the mixture of exhaust and dilution air must be measured, and a continuously proportioned sample of volume must be collected for analysis. Mass emissions are determined from the sample concentration and total flow over the test period.

(2) *Positive displacement pump.* The positive displacement pump-constant volume sampler (PDP-CVS), Figure B82-1, satisfies the first condition by metering at a constant temperature and pressure through the pump. The total volume is measured by counting the revolutions made by the calibrated positive displacement pump. The proportional sample is achieved by sampling at a constant flow rate.

(3) *Critical flow venturi.* The operation of the critical flow venturi (CFV) sample system, Figure B82-2, is based upon the principles of fluid dynamics associated with critical flow. Proportional sampling throughout temperature excursions is maintained by use of a small CFV in the sample line. The variable mixture flow rate is maintained at sonic velocity, is inversely proportional to the square root of the gas temperature, and is computed continuously. Since the pressure and temperature are the same at both venturi inlets, the sample volume is proportional to the total volume.

(4) *Other systems.* Other sampling systems may be used if shown to yield equivalent results, and if approved in advance by the Administrator.

(b) *Component description, PDP-CVS.* The PDP-CVS, Figure B82-1, consists of a dilution air filter and mixing assembly, heat exchanger, positive displacement pump, sampling system, and associated valves, pressure and temperature sensors. The PDP-CVS shall conform to the following requirements:

(1) Static pressure variations at the tailpipe(s) of the vehicle shall remain within ±5 inches of water (1.2 kPa) of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). (Sampling systems capable of maintaining the static pressure to within ±1 inch of water (0.25 kPa) will be used by the Administrator if a written request substantiates the need for this closer tolerance.)

(2) The gas mixture temperature, measured at a point immediately ahead of the positive displacement pump, shall be within ±10° F (6° C) of the designed operating temperature at the start of the test. The gas mixture temperature variation from its value at the start of the test shall be limited to ±10° F (6° C) during the entire test. The temperature measuring system shall have an accuracy and precision of ±2° F (1.1° C).

(3) The pressure gauges shall have an accuracy and precision of ±1.6 inches of water (0.4 kPa).

(4) The flow capacity of the CVS shall be large enough to virtually eliminate water condensation in the system. (300 to 350 cfm (0.142 to 0.165 m^3/s) is sufficient for most vehicles.)

(5) Sample collection bags for dilution air and exhaust samples shall be sufficient size so as not to impede sample flow.

(c) *Component description, CFV.* The CFV sample system, Figure B82-2, consists of a dilution air filter and mixing assembly, a cyclone particulate separator, a sampling venturi, a critical flow venturi, a sampling system and assorted valves, and pressure and temperature sensors. The CFV sample system shall conform to the following requirements:

(1) Static pressure variations at the tailpipe(s) of the vehicle shall remain within ±5 inches of water (1.2 kPa) of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). (Sampling systems capable of maintaining the static pressure to within ±1 inch of water (0.25 kPa) will be used by the Administrator if a written request substantiates the need for this closer tolerance.)

(2) The temperature measuring system shall have an accuracy and precision of ±2° F (1.1° C) and a response time of 0.100 seconds of 62.5 percent of a temperature change (as measured in hot silicone oil).

(3) The pressure measuring system shall have an accuracy and precision of ±1.6 inches of water (0.4 kPa).

(4) The flow capacity of the CVS shall be large enough to virtually eliminate water condensation in the system. (300 to 350 cfm (0.142 to 0.165 m^3/s) is sufficient for most vehicles.)

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow.

[45 FR 14509, Mar. 5, 1980]

§ 86.109-90 Exhaust gas sampling system; Otto-cycle vehicles.

(a)(1) *General.* The exhaust gas sampling system described in this paragraph is designed to measure the true mass of gaseous emissions in the exhaust of either Otto-cycle light-duty vehicles and light-duty trucks. In the CVS concept of measuring mass emissions, two conditions must be satisfied: the total volume of the mixture of exhaust and dilution air must be measured, and a continuously proportioned volume of sample must be collected for analysis. Mass emissions are determined from the sample concentration and total flow over the test period.

(2) *Vehicle tailpipe to CVS Duct.* For methanol-fueled vehicles, cooling of the exhaust gases in the duct connecting the vehicle tailpipe to the CVS shall be minimized. This may be is accomplished by:

(i) Using a duct of unrestricted length maintained at 235°±15°F (113°±8°C), heating and possible cooling capabilities are required; or

(ii) Using a short duct (up to 12 feet long) constructed of smooth wall pipe with a minimum of flexible sections, maintained at 235°±15°F (113°±8°C) prior to the test and during the 10 minute hot soak segment and uninsulated during the test (insulation may remain in place and/or heating may occur during testing provided maximum temperature is not exceeded); or

(iii) Using smooth wall duct less than five feet long with no required heating.

(iv) Omitting the duct and performing the exhaust gas dilution function at the vehicle tailpipe exit.

(3) *Positive displacement pump.* The Positive Displacement Pump-Constant Volume Sampler (PDP-CVS), Figure B90-1 satisfies the first condition by metering at a constant temperature and pressure through the pump. The total volume is measured by counting the revolutions made by the calibrated positive displacement pump. The proportional samples for the bag sample, and for methanol-fueled vehicles, the methanol sample (Figure B90-2) and the formaldehyde sample (Figure B90-3), are achieved by sampling at a constant flow rate. For methanol-fueled vehicles, the sample lines for the methanol and formaldehyde samples are heated to 235°±15°F (113°±8°C).

NOTE: For 1990 through 1994 model year methanol-fueled vehicles, methanol and formaldehyde sampling may be omitted provided the bag sample (hydrocarbons and methanol) is analyzed using a HFID calibrated with methanol.

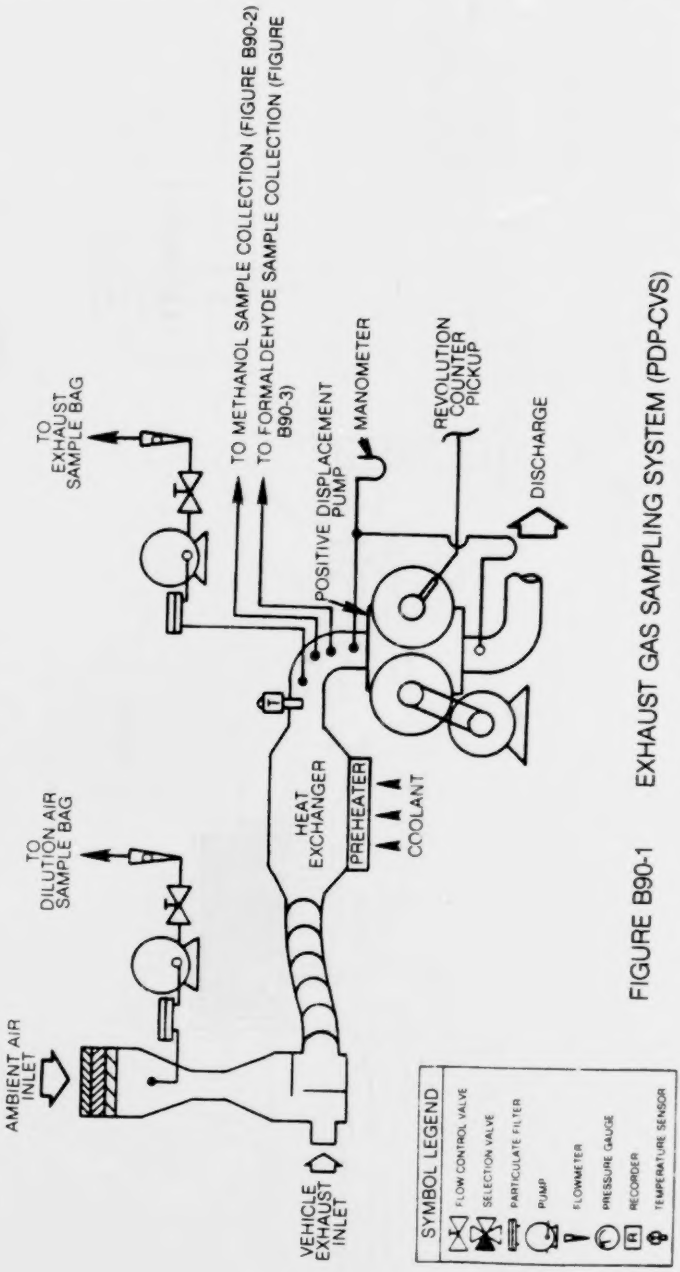

AMBIENT AIR INLET
TO DILUTION AIR SAMPLE BAG
TO EXHAUST SAMPLE BAG
TO METHANOL SAMPLE COLLECTION (FIGURE B90-2)
TO FORMALDEHYDE SAMPLE COLLECTION (FIGURE B90-3)
POSITIVE DISPLACEMENT PUMP
MANOMETER
REVOLUTION COUNTER PICKUP
DISCHARGE
HEAT EXCHANGER
PREHEATER
COOLANT
T
VEHICLE EXHAUST INLET
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
R RECORDER
TEMPERATURE SENSOR

FIGURE B90-1 EXHAUST GAS SAMPLING SYSTEM (PDP-CVS)

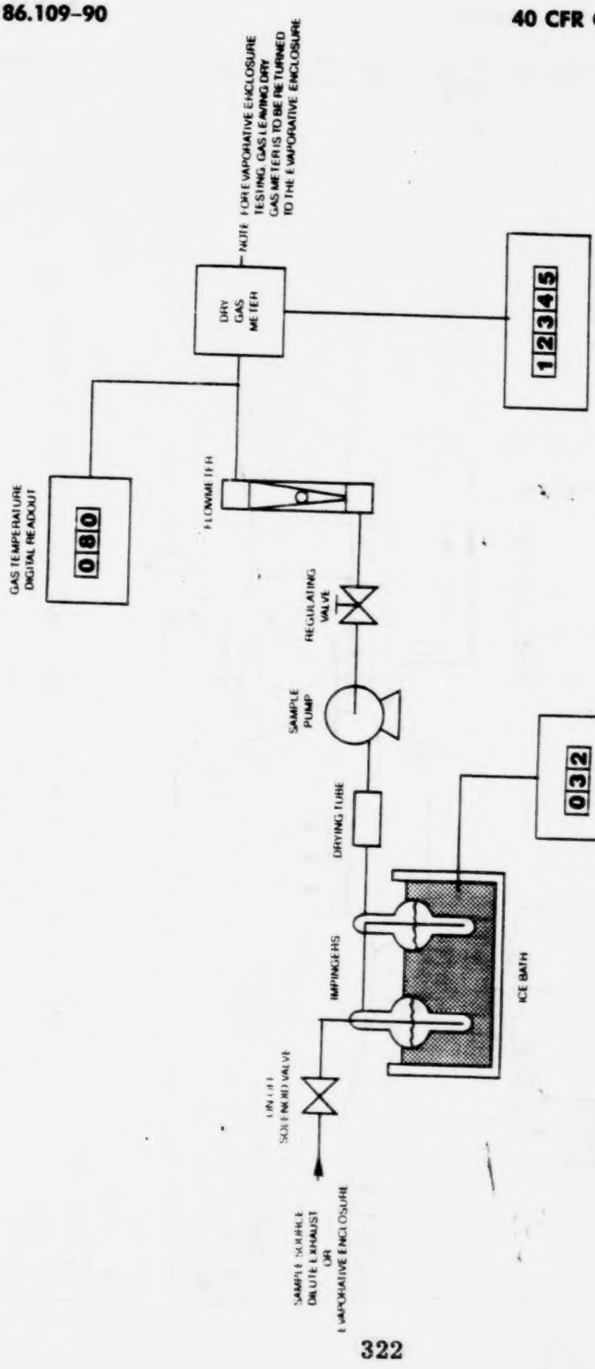

SAMPLE SOURCE
DILUTE EXHAUST
OR
EVAPORATIVE ENCLOSURE
ON OFF
SOLENOID VALVE
IMPINGERS
ICE BATH
DRYING TUBE
ICE BATH
TEMPERATURE READOUT
032
SAMPLE
PUMP
REGULATING
VALVE
FLOWMETER
GAS TEMPERATURE
DIGITAL READOUT
080
DRY
GAS
METER
GAS VOLUME
DIGITAL READOUT
12345
NOTE: FOR EVAPORATIVE ENCLOSURE
TESTING, GAS LEAVING DRY
GAS METER IS TO BE RETURNED
TO THE EVAPORATIVE ENCLOSURE

FIGURE N90-2 METHANOL SAMPLE COLLECTION FLOW SCHEMATIC

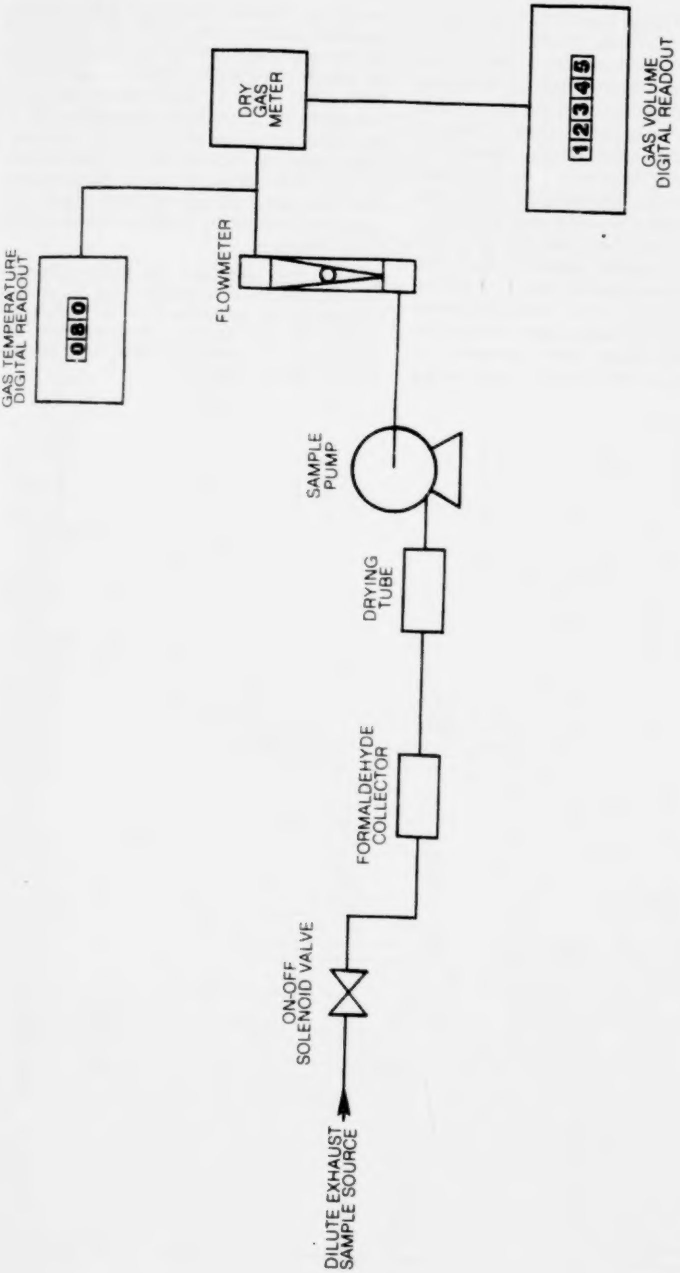

DILUTE EXHAUST SAMPLE SOURCE
ON-OFF SOLENOID VALVE
FORMALDEHYDE COLLECTOR
DRYING TUBE
SAMPLE PUMP
FLOWMETER
GAS TEMPERATURE DIGITAL READOUT
080
DRY GAS METER
GAS VOLUME DIGITAL READOUT
12345

FIGURE B90-3 FORMALDEHYDE SAMPLE COLLECTION FLOW SCHEMATIC

(4) *Critical flow venturi.* The operation of the Critical Flow Venturi—Constant Volume Sampler (CFV-CVS) sample system, Figure B90-4, is based upon the principles of fluid dynamics associated with critical flow. Proportional sampling throughout temperature excursions is maintained by use of small CFVs in the sample lines (for methanol-fueled vehicles, one line supplies sample for the bag sample, another line supplies sample for the methanol sample, and a third line supplies sample for the formaldehyde sample.) The methanol and formaldehyde sample lines are heated to 235°±15°F (113°±8°C) with care being taken to ensure that the CFVs of the sample probes are not heated since heating of the CFVs would cause loss of proportionality. The variable mixture flow rate is maintained at sonic velocity, is inversely proportional to the square root of the gas temperature, and is computed continuously. Since the pressure and temperature are the same at all venturi inlets, the sample volume is proportional to the total volume.

NOTE: For 1990 through 1994 model year methanol-fueled vehicles, methanol and formaldehyde sampling may be omitted provided the bag sample (hydrocarbons and methanol) is analyzed using a HFID calibrated with methanol.

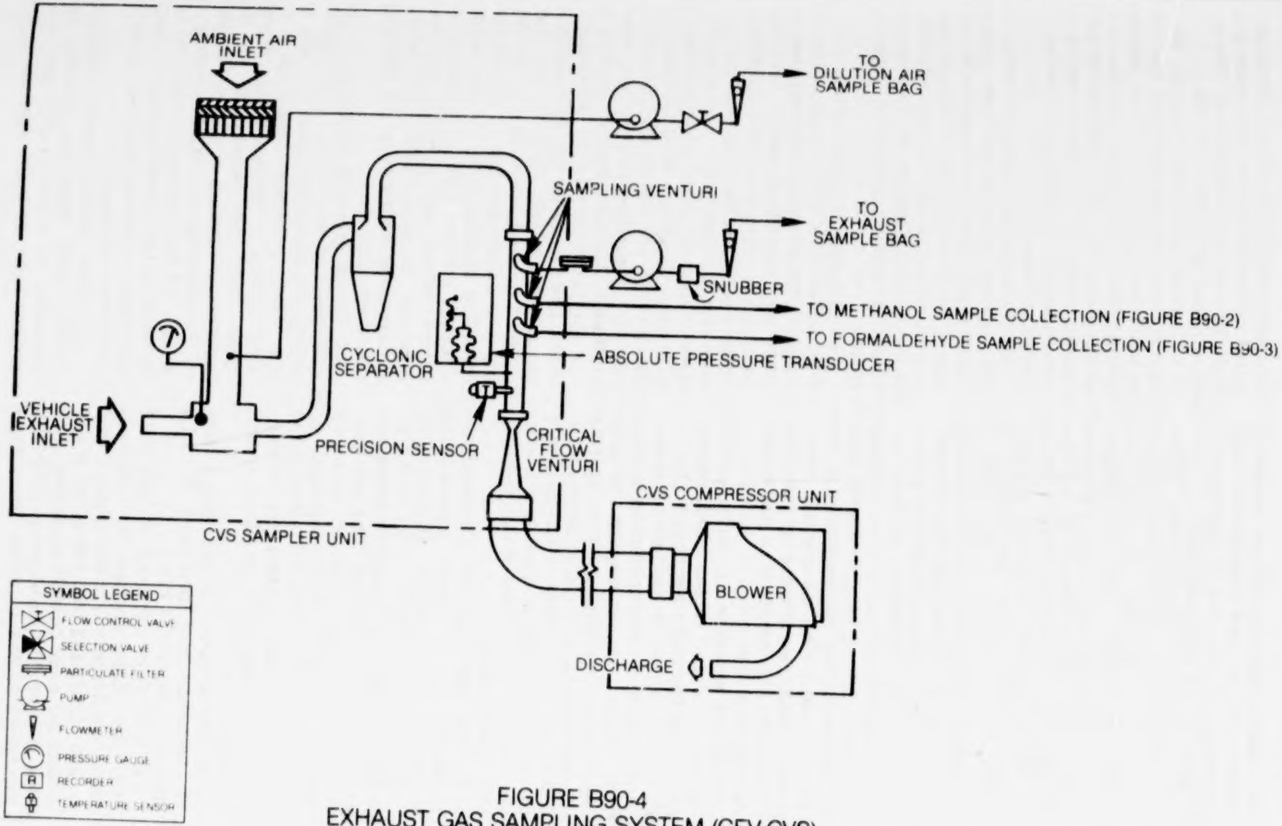

AMBIENT AIR INLET
TO DILUTION AIR SAMPLE BAG
SAMPLING VENTURI
TO EXHAUST SAMPLE BAG
SNUBBER
TO METHANOL SAMPLE COLLECTION (FIGURE B90-2)
TO FORMALDEHYDE SAMPLE COLLECTION (FIGURE B90-3)
ABSOLUTE PRESSURE TRANSDUCER
CYCLONIC SEPARATOR
VEHICLE EXHAUST INLET
PRECISION SENSOR
CRITICAL FLOW VENTURI
CVS COMPRESSOR UNIT
CVS SAMPLER UNIT
BLOWER
DISCHARGE
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
R RECORDER
TEMPERATURE SENSOR

FIGURE B90-4
EXHAUST GAS SAMPLING SYSTEM (CFV-CVS)

(5) *Other systems.* Other sampling systems may be used if shown to yield equivalent results, and if approved in advance by the Administrator.

(b) *Component description, PDP-CVS.* The PDP-CVS, Figure B90-1, consists of a dilution air filter and mixing assembly, heat exchanger, positive displacement pump, sampling systems (see Figure B90-2 for methanol sampling system and Figure B90-3 for formaldehyde sampling system) sampling lines which are heated to 235°±15°F (113°±8°C) in the case of the methanol-fueled vehicles (heating of the sample lines may be omitted, provided the methanol and formaldehyde sample collection systems are close coupled to the probes thereby preventing loss of sample due to cooling and resulting condensation in the sample lines), and associated valves, pressure and temperature sensors. The PDP-CVS shall conform to the following requirements:

(1) Static pressure variations at the tailpipe(s) of the vehicle shall remain within ±5 inches of water (1.2 kPa) of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). (Sampling systems capable of maintaining the static pressure to within ±1 inch of water (0.25 kPa) will be used by the Administrator if a written request substantiates the need for this closer tolerance.)

(2) The gas mixture temperature, measured at a point immediately ahead of the positive displacement pump, shall be within ±10°F (±5.6°C) of the designed operating temperature at the start of the test. The gas mixture temperature variation from its value at the start of the test shall be limited to ±10°F (±5.6°C) during the entire test. The temperature measuring system shall have an accuracy and precision of ±2°F (1.1°C).

(3) The pressure gauges shall have an accuracy and precision of ±1.6 inches of water (0.4 kPa).

(4) The flow capacity of the CVS shall be large enough to eliminate water condensation in the system. (300 to 350 cfm (0.142 to 0.165 m^3/s) is sufficient for most petroleum-fueled vehicles. Higher flow rates are required for methanol fueled vehicles. Procedures for determining CVS flow rates are detailed in "Calculation of Emissions and Fuel Economy When Using Alternative Fuels," EPA 460/3-83-009.)

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow. A single dilution air sample, covering the total test period, may be collected for determination of formaldehyde background (methanol-fueled vehicles).

(6) The methanol sample collection system and the formaldehyde sample collection system shall each be of sufficient capacity so as to collect samples of adequate size for analysis without significant impact on the volume of dilute exhaust passing through the PDP.

(c) *Component description, CFV-CVS.* The CFV-CVS sample system, Figure B90-4, consists of a dilution air filter and mixing assembly, a cyclone particulate separator, unheated sampling venturies for the bag samples and for the methanol and formaldehyde samples from methanol-fueled vehicles, samples lines heated to 235°±15°F (113°±8°C) for the methanol and formaldehyde samples from methanol fueled vehicles (heating of the sample lines may be omitted provided, the methanol and formaldehyde sample collection systems are close coupled to the probes thereby preventing loss of sample due to cooling and resulting condensation in the sample lines), a critical flow venturi, and assorted valves, and pressure and temperature sensors. The CFV sample system shall conform to the following requirements:

(1) Static pressure variations at the tailpipe(s) of the vehicle shall remain within ±5 inches of water (1.2 kPa) of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). (Sampling systems capable of maintaining the static pressure to within ±1 inch of water (0.25 kPa) will be used by the Administrator if a written request substantiates the need for this closer tolerance.)

(2) The temperature measuring system shall have an accuracy and precision of ±2°F (1.1°C) and a response time of 0.100 seconds to 62.5

percent of a temperature change (as measured in hot silicone oil).

(3) The pressure measuring system shall have an accuracy and precision of ±1.6 inches of water (0.4 kPa).

(4) The flow capacity of the CVS shall be large enough to virtually eliminate water condensation in the system (300 to 350 cfm (0.142 to 0.165 m^3/s) is sufficient for most petroleum-fueled vehicles). Higher flow rates are required with methanol-fueled vehicles. Procedures for determining CVS flow rates are detailed in "Calculation of Emission and Fuel Economy When Using Alternative Fuels," EPA 460/3-83-009.

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow. A single dilution air sample covering the total test period may be collected for determination of formaldehyde background for methanol-fueled vehicles.

(6) The methanol sample collection system and the formaldehyde sample collection system shall each be of sufficient capacity so as to collect samples of adequate size for analysis without significant impact on the volume of dilute exhaust passing through the CFV-CVS.

[54 FR 14500, Apr. 11, 1989]

§ 86.110–82 Exhaust gas sampling system; diesel vehicles.

(a) *General.* The exhaust gas sampling system described in this paragraph is designed to measure the true mass of both gaseous and particulate emissions in the exhaust of light-duty Diesel vehicles. This system utilizes the CVS concept (described in § 86.109) of measuring mass emissions. The mass of gaseous emissions is determined from the sample concentration and total flow over the test period. The mass of particulate emissions is determined from a proportional mass sample collected on a filter and from the total flow over the test period. General requirements are as follows:

(1) This sampling system requires the use of a PDP-CVS or CFV sample system with heat exchanger connected to a dilution tunnel. Figure B82–3 is a schematic drawing of the PDP system. Figure B82–4 is a schematic drawing of the CFV system.

(2) Diesel vehicles require a heated flame ionization detector (HFID) sample for hydrocarbon analysis. The HFID sample must be taken directly from the diluted exhaust stream through a heated probe in the dilution tunnel.

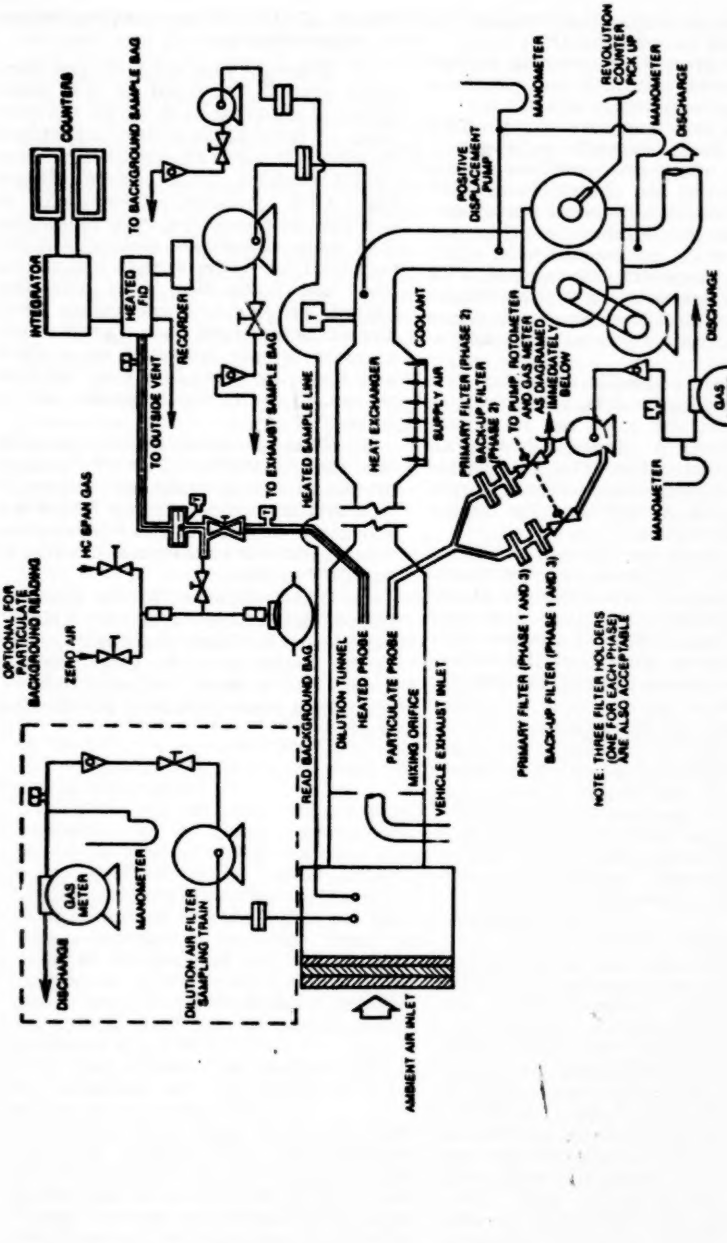

INTEGRATOR
COUNTERS
HEATED FID
RECORDER
TO BACKGROUND SAMPLE BAG
TO OUTSIDE VENT
TO EXHAUST SAMPLE BAG
HEATED SAMPLE LINE
HEAT EXCHANGER
COOLANT
SUPPLY AIR
POSITIVE DISPLACEMENT PUMP
MANOMETER
REVOLUTION COUNTER PICK UP
MANOMETER
DISCHARGE
PRIMARY FILTER (PHASE 2)
BACK-UP FILTER (PHASE 2)
TO PUMP, ROTOMETER AND GAS METER AS DIAGRAMED IMMEDIATELY BELOW
DISCHARGE
GAS METER
MANOMETER
OPTIONAL FOR PARTICULATE BACKGROUND READING
ZERO AIR
HC SPAN GAS
READ BACKGROUND BAG
DILUTION TUNNEL
HEATED PROBE
PARTICULATE PROBE
MIXING ORIFICE
VEHICLE EXHAUST INLET
PRIMARY FILTER (PHASE 1 AND 3)
BACK-UP FILTER (PHASE 1 AND 3)
NOTE: THREE FILTER HOLDERS (ONE FOR EACH PHASE) ARE ALSO ACCEPTABLE
DISCHARGE
GAS METER
MANOMETER
DILUTION AIR FILTER SAMPLING TRAIN
AMBIENT AIR INLET

FIGURE B82-3
GASEOUS AND PARTICULATE EMISSIONS SAMPLING SYSTEM (PDP-CVS)
(FOR DIESEL VEHICLES ONLY)

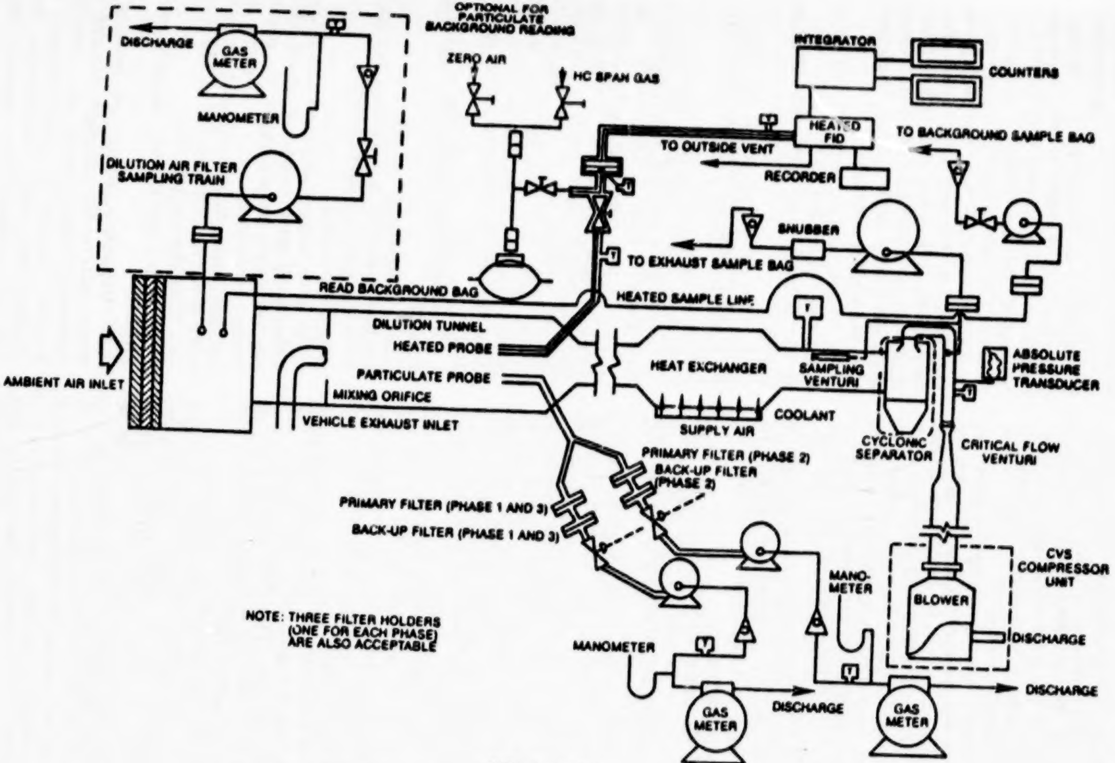

OPTIONAL FOR PARTICULATE BACKGROUND READING
DISCHARGE
GAS METER
MANOMETER
DILUTION AIR FILTER SAMPLING TRAIN
ZERO AIR
HC SPAN GAS
INTEGRATOR
COUNTERS
HEATED FID
TO BACKGROUND SAMPLE BAG
TO OUTSIDE VENT
RECORDER
SNUBBER
TO EXHAUST SAMPLE BAG
READ BACKGROUND BAG
HEATED SAMPLE LINE
DILUTION TUNNEL
HEATED PROBE
AMBIENT AIR INLET
PARTICULATE PROBE
MIXING ORIFICE
VEHICLE EXHAUST INLET
HEAT EXCHANGER
SAMPLING VENTURI
ABSOLUTE PRESSURE TRANSDUCER
COOLANT
SUPPLY AIR
CYCLONIC SEPARATOR
CRITICAL FLOW VENTURI
PRIMARY FILTER (PHASE 2)
BACK-UP FILTER (PHASE 2)
PRIMARY FILTER (PHASE 1 AND 3)
BACK-UP FILTER (PHASE 1 AND 3)
CVS COMPRESSOR UNIT
MANO-METER
BLOWER
DISCHARGE
NOTE: THREE FILTER HOLDERS (ONE FOR EACH PHASE) ARE ALSO ACCEPTABLE
MANOMETER
DISCHARGE
GAS METER
DISCHARGE
GAS METER

FIGURE B82-4
GASEOUS AND PARTICULATE EMISSIONS SAMPLING SYSTEM (CFV-CVS)
(FOR DIESEL VEHICLES ONLY)

(3) Bag, HFID and particulate sampling capabilities as shown in Figure B82-3 (or Figure B82-4) are required to provide both gaseous and particulate emissions sampling capabilities from a single system.

(4) Since various configurations can produce equivalent results, exact conformance with these drawings is not required. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems.

(5) Other sampling systems may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(b) *Component description.* The components necessary for Diesel exhaust sampling shall meet the following requirements:

(1) The PDP-CVS, Figure B82-3, shall conform to all of the requirements listed for the exhaust gas PDP-CVS (§ 86.109(b)), with one exception: A flow rate of sufficient volume is required to maintain the diluted exhaust stream, from which the particulate sample flow is taken, at a temperature of 125°F (52°C) or less.

(2) The CFV sample system, Figure B82-4, shall conform to all of the requirements listed for the exhaust gas CFV sample system (§ 86.109(c)), with four exceptions:

(i) A flow rate of sufficient volume is required to maintain the diluted exhaust stream, from which the particulate sample flow is taken, at a temperature of 125°F (52°C) or less.

(ii) A heat exchanger is required.

(iii) The gas mixture temperature, measured at a point immediately ahead of the critical flow venturi, shall be within ±20°F (11°C) of the designed operating temperature at the start of the test. The gas mixture temperature variation from its value at the start of the test shall be limited to ±20°F (11°C) during the entire test. The temperature measuring system shall have an accuracy and precision of ±2°F (1.1°C).

(iv) The cyclonic separator is optional.

(3) The transfer of heat from the vehicle exhaust gas shall be minimized between the point where it leaves the vehicle tailpipe(s) and the point where it enters the dilution tunnel airstream. To accomplish this, a short length (not more than 12 feet (365 cm) if uninsulated, or not more than 20 feet (610 cm) if insulated) of smooth stainless steel tubing from the tailpipe to the dilution tunnel is required. This tubing shall have a maximum inside diameter of 4.0 inches (10.2 cm). Short sections of flexible tubing at connection points are allowed.

(4) The vehicle exhaust shall be directed downstream at the point where it is introduced into the dilution tunnel.

(5) The dilute air shall be between 68°F (20°C) and 86°F (30°C) during the test.

(6) The dilution tunnel shall be:

(i) Sized to permit development of turbulent flow (Reynold's No. >>4000) and complete mixing of the exhaust and dilution air between the mixing orifice and each of the two sample probes (i.e., the particulate probe and the heated HC sample probe). It is recommended that uniform mixing be demonstrated by the user.

(ii) At least 8.0 inches (20.3 cm) in diameter.

(iii) Constructed of electrically conductive material which does not react with the exhaust components.

(iv) Grounded.

(7) The temperature of the diluted exhaust stream inside of the dilution tunnel shall be sufficient to prevent water condensation. However, the sample zone dilute exhaust temperature shall not exceed 125° F (52° C) at any time during the test.

(8) The particulate sample probe shall be:

(i) Installed facing upstream at a point where the dilution air and exhaust are well mixed (i.e., near the tunnel centerline, approximately 10 tunnel diameters downstream from the point where the exhaust enters the dilution tunnel).

(ii) Sufficiently distant (radially) from the total hydrocarbon probe so as to be free from the influence of any wakes or eddies produced by the total hydrocarbon probe.

(iii) 0.5 inch (1.27 cm) minimum inside diameter.

(iv) The distance from the sampling tip to the filter holder shall be at least 5 probe diameters (for filters located inside of the tunnel), but not more than 40.0 inches (102 cm) for filters located outside of the dilution tunnel.

(v) Free from sharp bends.

(vi) Configured so that a clean particulate filter (including back-up filter) can be selected simultaneously with the selection of an empty gaseous emissions bag.

(9) The flow rate through the particulate probe shall be maintained to a constant value within ±5 percent of the set flow rate.

(10) The particulate sample pump shall be located sufficiently distant from the dilution tunnel so that the inlet gas temperature is maintained at a constant temperature (±5.0° F (2.8° C)).

(11) The gas meters or flow instrumentation shall be located sufficiently distant from the tunnel so that the inlet gas temperature remains constant (±5.0° F (2.8° C)).

(12) The total hydrocarbon probe shall be:

(i) Installed facing upstream at a point where the dilution air and exhaust are well mixed (i.e., approximately 10 tunnel diameters downstream from the point where the exhaust enters the dilution tunnel).

(ii) Sufficiently distant (radially) from the particulate probe so as to be free from the influence of any wakes or eddies produced by the particulate probe.

(iii) Heated and insulated over the entire length to maintain a 375°±20° F (191°±11° C) *wall* temperature.

(iv) 0.19 in. (0.457 cm) minimum inside diameter.

(13) It is intended that the total hydrocarbon probe be free from cold spots (i.e., free from spots where the probe *wall* temperature is less than 355° F). This will be determined by a temperature sensor located on a section of the probe wall outside of the dilution tunnel. The temperature sensor shall be insulated from any heating elements on the probe. The sensor shall have an accuracy and precision of ±2° F (1.1° C).

(14) The *dilute exhaust gas* flowing in the total hydrocarbon sample system shall be:

(i) At 375° ±10° F (191° ±6° C) immediately before the heated filter. This will be determined by a temperature sensor located immediately upstream of the filter. The sensor shall have an accuracy and precision of ±2° F (1.1° C).

(ii) At 375° F ±10° F (191° ±6° C) immediately before the HFID. This will be determined by a temperature sensor located at the exit of the heated sample line. The sensor shall have an accuracy and precision of ±2° F (1.1° C).

(15) It is intended that the *dilute exhaust gas* flowing in the total hydrocarbon sample system be between 365°F and 385°F (185°C and 197°C).

(c) *Filters, particulate sampling*—(1) *Filter acceptance criteria.* Valid diesel particulate net filter weights shall be accepted according to the following criteria:

(i) During each phase of the UDDS, dilute exhaust will be simultaneously sampled by paired primary test and back-up test filters.

(ii) The back-up filter holder shall be located 3 to 4 inches downstream of the primary filter holder.

(iii) The net weight of particulate material collected on each primary test filter and each back-up test filter shall be determined by the procedure outlined in § 86.139.

(iv) A ratio of net weights will be determined by the following formula:

Ratio of net weights=

$$\frac{(\text{Mass particulate})_{\text{primary filter}}}{(\text{Mass particulate})_{\text{primary filter}} + (\text{Mass particulate})_{\text{back up filter}}}$$

(v) If the ratio is greater than 0.95, then particulate emissions calculations are based on the net weight of the primary filter only.

(vi) If the ratio is less than 0.95, then particulate emissions calculations are based on the combined net weights of the back-up test filter and the primary test filter.

(2) The particulate filter must have a minimum 47 mm diameter (37 mm stain area). Larger diameter filters are also acceptable. (Larger diameter filters may be desirable in order to reduce the pressure drop across the filter when testing vehicles which produce large amounts of particulate.)

(3) The recommended minimum loading on the primary 47 mm filter is 0.5 milligrams. Equivalent loadings (i.e., mass/stain area) are recommended for larger filters.

(4) Fluorocarbon coated glass fiber filters or fluorocarbon based (membrane) filters are required for particulate collection.

[45 FR 14509, Mar. 5, 1980, as amended at 46 FR 50493, Oct. 13, 1981; 47 FR 49807, Nov. 2, 1982; 52 FR 47868, Dec. 16, 1987]

§ 86.110-90 Exhaust gas sampling system; diesel vehicles.

(a) *General.* The exhaust gas sampling system described in this paragraph is designed to measure the true mass of both gaseous and particulate emissions in the exhaust of either diesel light-duty vehicles and light-duty trucks. This system utilizes the CVS concept (described in § 86.109) of measuring mass emissions. The mass of gaseous emissions is determined from the sample concentration and total flow over the test period. The mass of particulate emissions is determined from a proportional mass sample collected on a filter and from the total flow over the test period. General requirements are as follows:

(1) This sampling system requires the use of a PDP-CVS or a CFV sample system with heat exchanger connected to a dilution tunnel. Figure B90-5 is a schematic drawing of the PDP system. Figure B90-6 is a schematic drawing of the CFV system (methanol-fueled Otto-cycle vehicles may be tested using this test equipment.)

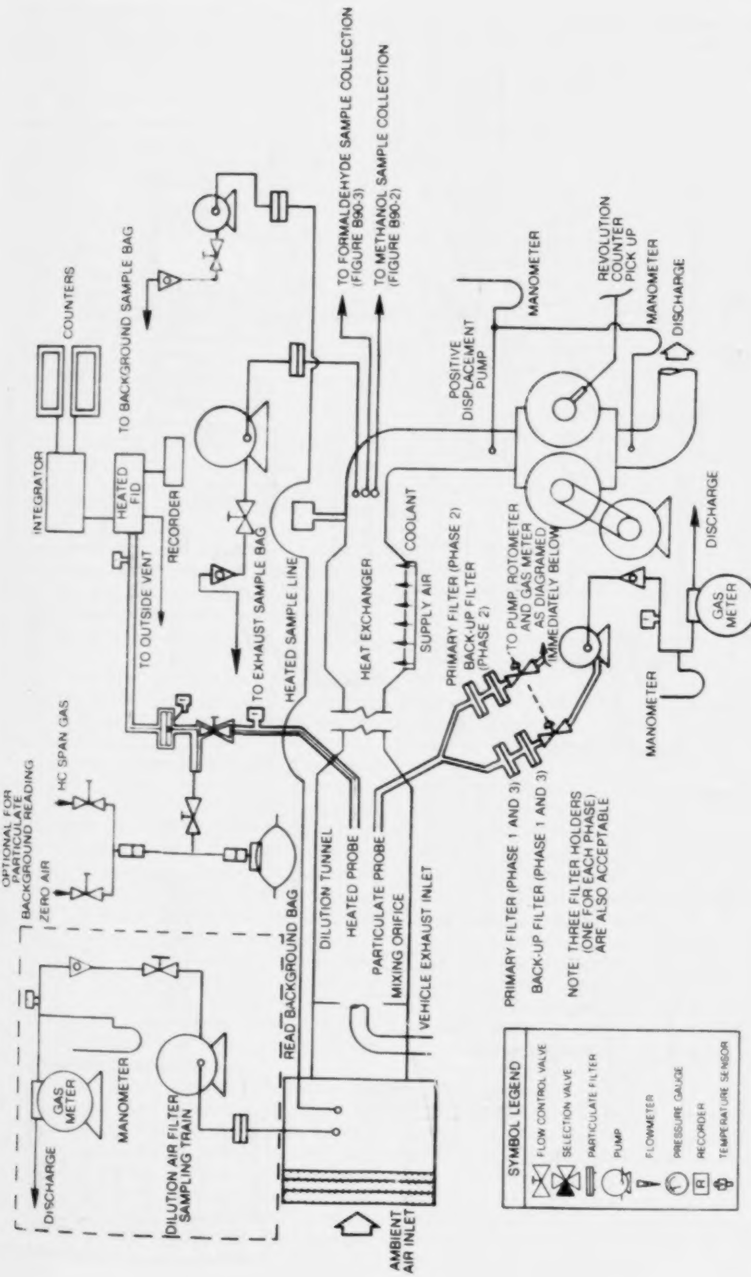

OPTIONAL FOR PARTICULATE BACKGROUND READING
ZERO AIR
HC SPAN GAS
INTEGRATOR
COUNTERS
TO BACKGROUND SAMPLE BAG
HEATED FID
RECORDER
TO OUTSIDE VENT
TO EXHAUST SAMPLE BAG
HEATED SAMPLE LINE
TO FORMALDEHYDE SAMPLE COLLECTION (FIGURE B90-3)
TO METHANOL SAMPLE COLLECTION (FIGURE B90-2)
HEAT EXCHANGER
SUPPLY AIR
COOLANT
POSITIVE DISPLACEMENT PUMP
MANOMETER
REVOLUTION COUNTER PICK UP
MANOMETER
DISCHARGE
PRIMARY FILTER (PHASE 2)
BACK-UP FILTER (PHASE 2)
TO PUMP, ROTOMETER AND GAS METER AS DIAGRAMED IMMEDIATELY BELOW
DISCHARGE
GAS METER
MANOMETER
DILUTION TUNNEL
HEATED PROBE
PARTICULATE PROBE
MIXING ORIFICE
VEHICLE EXHAUST INLET
PRIMARY FILTER (PHASE 1 AND 3)
BACK-UP FILTER (PHASE 1 AND 3)
NOTE: THREE FILTER HOLDERS (ONE FOR EACH PHASE) ARE ALSO ACCEPTABLE
READ BACKGROUND BAG
DISCHARGE
GAS METER
MANOMETER
DILUTION AIR FILTER SAMPLING TRAIN
AMBIENT AIR INLET
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
R RECORDER
TEMPERATURE SENSOR

FIGURE B90-5
GASEOUS AND PARTICULATE EMISSIONS SAMPLING SYSTEM (PDP-CVS)

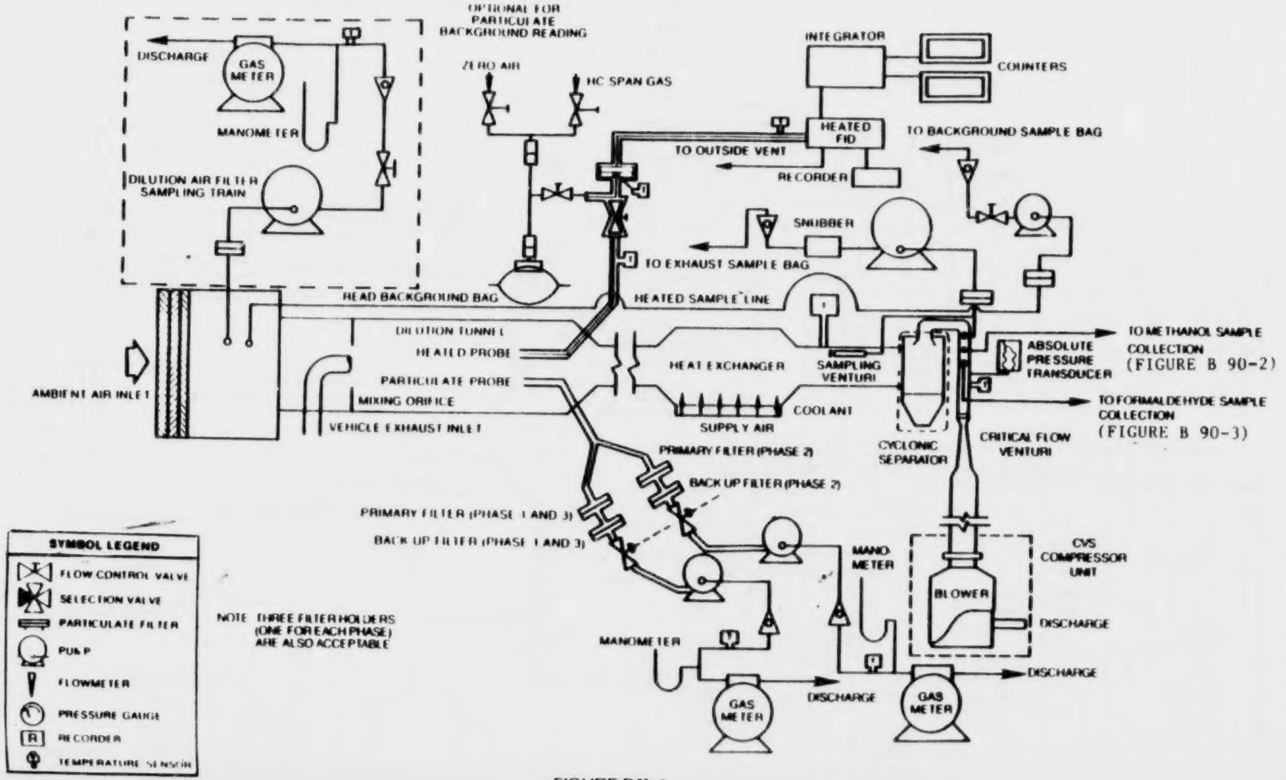

OPTIONAL FOR
PARTICULATE
BACKGROUND READING
DISCHARGE
GAS METER
MANOMETER
DILUTION AIR FILTER SAMPLING TRAIN
ZERO AIR
HC SPAN GAS
INTEGRATOR
COUNTERS
HEATED FID
TO BACKGROUND SAMPLE BAG
TO OUTSIDE VENT
RECORDER
SNUBBER
TO EXHAUST SAMPLE BAG
READ BACKGROUND BAG
HEATED SAMPLE LINE
DILUTION TUNNEL
HEATED PROBE
PARTICULATE PROBE
MIXING ORIFICE
VEHICLE EXHAUST INLET
AMBIENT AIR INLET
HEAT EXCHANGER
SAMPLING VENTURI
COOLANT
SUPPLY AIR
CYCLONIC SEPARATOR
CRITICAL FLOW VENTURI
ABSOLUTE PRESSURE TRANSDUCER
TO METHANOL SAMPLE COLLECTION (FIGURE B 90-2)
TO FORMALDEHYDE SAMPLE COLLECTION (FIGURE B 90-3)
PRIMARY FILTER (PHASE 2)
BACK UP FILTER (PHASE 2)
PRIMARY FILTER (PHASE 1 AND 3)
BACK UP FILTER (PHASE 1 AND 3)
MANO-METER
CVS COMPRESSOR UNIT
BLOWER
DISCHARGE
MANOMETER
GAS METER
DISCHARGE
GAS METER
DISCHARGE
NOTE THREE FILTER HOLDERS (ONE FOR EACH PHASE) ARE ALSO ACCEPTABLE
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
R RECORDER
TEMPERATURE SENSOR

FIGURE B90-6

GASEOUS AND PARTICULATE EMISSIONS SAMPLING SYSTEM (CFV CVS)

(2) Bag, HFID, and particulate sampling capabilities as shown in Figure B90-5 (or Figure B90-6) are required to provide both gaseous and particulate emissions sampling capabilities from a single system.

(3) Petroleum-fueled diesel vehicles require a heated flame ionization detector (HFID) (375°±20°F (191°±11°C)) sample for hydrocarbon analysis. The HFID sample must be taken directly from the diluted exhaust stream through a heated probe in the dilution tunnel.

(4) Methanol-fueled vehicles require the use of a heated flame ionization detector (HFID) (235°±15°F (113°±8°C)) for hydrocarbon analysis. With an HFID, the hydrocarbon analysis can be made on the bag sample and the methanol and formaldehyde analyses are performed on the samples collected for these purposes (Figures B90-2 and B90-3). NOTE: For 1990 through 1994 model year methanol-fueled vehicles, methanol and formaldehyde sampling may be omitted provided the bag sample is analyzed using a HFID calibrated with methanol.

(5) Methanol-fueled vehicles require either:

(i) A tailpipe to dilution tunnel duct of unrestricted length maintained at 235°±15°F (113°±8°C) through heating and cooling as required; or

(ii) Using short duct (up to 12 feet long) constructed of smooth wall pipe with a minimum of flexible sections maintained at 235°±15°F (113°±°C) prior to the test and during breaks in testing (insulation may remain in place and/or heating may occur during testing provided maximum temperature is not exceeded); or

(iii) Using a smooth wall duct less than five feet long with no required heating, or

(iv) Omitting the duct and performing the exhaust gas dilution function at the vehicle tailpipe exit.

(6) Since various configurations can produce equivalent results, exact conformance with these drawings is not required. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems.

(7) Other sampling systems may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(b) *Component description—petroleum-fueled diesel vehicles.* The components necessary for petroleum fueled diesel vehicle exhaust sampling shall meet the following requirements:

(1) The PDP-CVS, Figure B90-5, shall conform to all of the requirements listed for the exhaust gas PDP-CVS (§ 86.109(b)), with one exception: a flow rate of sufficient volume is required to maintain the diluted exhaust stream, from which the particulate sample flow is taken, at a temperature of 125°F (52°C) or less.

(2) The CFV sample system, Figure B90-6, shall conform to all of the requirements listed for the exhaust gas CFV sample system (§ 86.109(c)), with four exceptions:

(i) A flow rate of sufficient volume is required to maintain the diluted exhaust stream, from which the particulate sample flow is taken, at a temperature of 125°F (52°C) or less.

(ii) A heat exchanger is required.

(iii) The gas mixture temperature, measured at a point immediately ahead of the critical flow venturi, shall be within ±20°F (11°C) of the designed operating temperature at the start of the test. The gas mixture temperature variation from its value at the start of the test shall be limited to ±20°F (11°C) during the entire test. The temperature measuring system shall have an accuracy and precision of ±2°F (1.1°C).

(iv) The cyclonic separator is optional.

(3) The transfer of heat from the vehicle exhaust gas shall be minimized between the point where it leaves the vehicle tailpipe(s) and the point where it enters the dilution tunnel airstream. To accomplish this, a short length (not more than 12 feet (365 cm) if uninsulated, or not more than 20 feet (610 cm) if insulated) of smooth stainless steel tubing from the tailpipe to the dilution tunnel is required. This tubing shall have a maximum inside diameter of 4.0 inches (10.2 cm). Short sections of flexible tubing at connection points are allowed.

(4) The vehicle exhaust shall be directed downstream at the point where it is introduced into the dilution tunnel.

(5) The dilution air shall be between 68°F (20°C) and 86°F (30°C) during the test.

(6) The dilution tunnel shall be:

(i) Sized to permit development of turbulent flow (Reynold's No. >>4000) and complete mixing of the exhaust and dilution air between the mixing orifice and each of the two sample probes (*i.e.*, the particulate probe and the heated HC sample probe). It is recommended that uniform mixing be demonstrated by the user.

(ii) At least 8.0 inches (20.3 cm) in diameter.

(iii) Constructed of electrically conductive material which does not react with the exhaust components.

(iv) Grounded.

(7) The temperature of the diluted exhaust stream inside of the dilution tunnel shall be sufficient to prevent water condensation. However, the sample zone dilute exhaust temperature shall not exceed 125°F (52°C) at any time during the test.

(8) The particulate sample probe shall be:

(i) Installed facing upstream at a point where the dilution air and exhaust are well mixed (*i.e.*, near the tunnel centerline, approximately 10 tunnel diameters downstream from the point where the exhaust enters the dilution tunnel).

(ii) Sufficiently distant (radially) from the total hydrocarbon probe so as to be free from the influence of any wakes or eddies produced by the total hydrocarbon probe.

(iii) 0.5 inch (1.27 cm) minimum inside diameter.

(iv) The distance from the sampling tip to the filter holder shall be at least 5 probe diameters (for filters located inside of the tunnel), but not more than 40.0 inches (102 cm) for filters located outside of the dilution tunnel.

(v) Free from sharp bends.

(vi) Configured so that a clean particulate filter (including back-up filter) can be selected simultaneously with the selection of an empty gaseous emissions bag.

(9) The flow rate through the particulate probe shall be maintained to a constant value within ±5 percent of the set flow rate.

(10) The particulate sample pump shall be located sufficiently distant from the dilution tunnel so that the inlet gas temperature is maintained at a constant temperature (±5.0°F (2.8°C)).

(11) The gas meters or flow instrumentation shall be located sufficiently distant from the tunnel so that the inlet gas temperature remains constant (±5.0°F (2.8°C)).

(12) The total hydrocarbon probe shall be:

(i) Installed facing upstream at a point where the dilution air and exhaust are well mixed (*i.e.*, approximately 10 tunnel diameters downstream from the point where the exhaust enters the dilution tunnel).

(ii) Sufficiently distant (radially) from the particulate probe so as to be free from the influence of any wakes or eddies produced by the particulate probe.

(iii) Heated and insulated over the entire length to maintain a 375°±20°F (191°±11°C) *wall* temperature.

(iv) 0.19 in. (0.48 cm) minimum inside diameter.

(13) It is intended that the total hydrocarbon probe be free from cold spots (*i.e.*, free from spots where the probe *wall* temperature is less than 355°F). This will be determined by a temperature sensor located on a section of the probe wall outside of the dilution tunnel. The temperature sensor shall be insulated from any heating elements on the probe. The sensor shall have an accuracy and precision of ±2°F (1.1°C).

(14) The dilute exhaust gas flowing in the total hydrocarbon sample system shall be:

(i) At 375°F±10°F (191°C±6°C) immediately before the heated filter. This will be determined by a temperature sensor located immediately upstream of the filter. The sensor shall have an accuracy and precision of ±2°F
(1.1°C).

(ii) At 375°F±10°F (191°C±6°C) immediately before the HFID. This will be determined by a temperature sensor located at the exit of the heated sample line. The sensor shall have an accuracy and precision of ±2°F (1.1°C).

(15) It is intended that the dilute exhaust gas flowing in the total hydrocarbon sample system be between 365°F and 385°F (185°C and 197°C).

(c) *Component description—methanol-fueled diesel vehicles.* The components necessary for methanol-fueled diesel vehicle exhaust sampling shall meet the following requirements:

(1) The PDP-CVS, Figure B90-5 shall conform to all of the requirements listed for the exhaust gas PDP-CVS (§ 86.109 (a)(3) and (b)), with one exception: a flow rate of sufficient volume is required to maintain the diluted exhaust stream, from which the particulate sample flow is taken, at a temperature of 125°F (52°C) or less and shall prevent the condensation of water vapor in the dilution tunnel.

(2) The CFV sample system, Figure B90-6 shall conform to all of the requirements listed for the exhaust gas CFV sample system (§ 86.109 (a)(4) and (c)), with four exceptions:

(i) A flow rate of sufficient volume is required to maintain the diluted exhaust stream, from which the particulate sample flow is taken, at a temperature of 125°F (52°C) or less and shall prevent the condensation of water vapor in the dilution tunnel.

(ii) A heat exchanger is required.

(iii) The gas mixture temperature, measured at a point immediately ahead of the critical flow venturi, shall be within ±20°F (11°C) of the designed operating temperature at the start of the test. The gas mixture temperature variation from its value at the start of the test shall be limited to ±20°F (11°C) during the entire test. The temperature measuring system shall have an accuracy and precision of ±2°F (1.1°C).

(iv) The cyclonic separator is optional.

(3) Losses of methanol due to condensation of water in the duct connecting the vehicle tail pipe to the dilation tunnel must be minimized. This may be accomplished by:

(i) The use of a duct of unrestricted length maintained at 235°±15°F (113°±8°C) through heating and cooling as required, or

(ii) The use of a short duct (up to 12 feet long) constructed of smooth wall pipe with a minimum of flexible sections maintained at 235°±15°F (113°±8°C) prior to the test and during breaks in testing (insulation may remain in place and/or heating may occur during testing provided maximum temperature is not exceeded); or

(iii) Using a smooth wall duct less than five feet long with no required heating, or

(iv) Omitting the duct and performing the exhaust gas dilution function at the vehicle tailpipe exit.

(4) The vehicle exhaust shall be directed downstream at the point where it is introduced into the dilution tunnel.

(5) The dilution air shall be between 68°F (20°C) and 86°F (30°C) during the test.

(6) The dilution tunnel shall be:

(i) Sized to permit development of turbulent flow (Reynold's No. >>4000) and complete mixing of the exhaust and dilution air between the mixing orifice and the particulate sample probe. It is recommended that uniform mixing be demonstrated by the user.

(ii) At least 8.0 inches (20.3 cm) in diameter.

(iii) Constructed of electrically conductive material which does not react with the exhaust components.

(iv) Grounded.

(7) The temperature of the diluted exhaust stream inside of the dilution tunnel shall be sufficient to prevent water condensation. However, the sample zone dilute exhaust temperature shall not exceed 125°F (52°C) at any time during the test.

(8) The particulate sample probe shall be:

(i) Installed facing upstream at a point where the dilution air and exhaust are well mixed (*i.e.,* near the tunnel centerline, approximately 10 tunnel diameters downstream from the point where the exhaust enters the dilution tunnel).

(ii) Sufficiently distant (radially) from the total hydrocarbon probe so as to be free from the influence of any wakes or eddies produced by the total hydrocarbon probe.

(iii) 0.5 inch (1.27 cm) minimum inside diameter.

(iv) The distance from the sampling tip to the filter holder shall be at least 5 probe diameters (for filters located inside of the tunnel), but not more than 40.0 inches (102 cm) for filters located outside of the dilution tunnel.

(v) Free from sharp bends.

(vi) Configured so that a clean particulate filter (including back up filter) can be selected simultaneously with the selection of an empty gaseous emissions bag.

(9) The flow rate through the particulate probe shall be maintained to a constant value within ±5 percent of the set flow rate.

(10) The particulate sample pump shall be located sufficiently distant from the dilution tunnel so that the inlet gas temperature is maintained at a constant temperature (±5.0°F (2.8°C)).

(11) The gas meters or flow instrumentation shall be located sufficiently distant from the tunnel so that the inlet gas temperature remains constant (±5.0°F (2.8°C)).

(12) The hydrocarbon probe shall be:

(i) Installed facing upstream at a point where the dilution air and exhaust are well mixed (*i.e.*, approximately 10 tunnel diameters downstream from the point where the exhaust enters the dilution tunnel).

(ii) Sufficiently distant (radially) from the particulate probe so as to be free from the influence of any wakes or eddies produced by the particulate probe.

(iii) Heated and insulated over the entire length to maintain a 235°±15°F (113°±8°C) *wall* temperature.

(iv) 0.19in. (0.48 cm) minimum inside diameter.

(13) It is intended that the total hydrocarbon probe be free from cold spots (*i.e.*, free from cold spots where the probe *wall* temperature is less than 220°F.) This will be determined by a temperature sensor located on a section of the probe wall outside of the dilution tunnel. The temperature sensor shall be insulated from any heating elements on the probe. The sensor shall have an accuracy and precision of ±2°F (1.1°C).

(14) The dilute exhaust gas flowing in the hydrocarbon sample system shall be:

(i) At 235°F±15°F (113°C±8°C) immediately before the heated filter. This will be determined by a temperature sensor located immediately upstream of the filter. The sensor shall have an accuracy and precision of ±2°F (1.1°C).

(ii) At 235°F±15°F (113°C ±8°C) immediately before the HFID. This will be determined by a temperature sensor located at the exit of the heated sample line. The sensor shall have an accuracy and precision of ±2°F (1.1°C).

(15) It is intended that the dilute exhaust gas flowing in the hydrocarbon sample system be between 220°F and 250°F (105°C and 121°c).

(16) For methanol-fueled vehicles bag sampling procedures for the measurement of hydrocarbons as described in Section 86.109 may be employed.

(d) Filters, particulate sampling.

(1) Filter acceptance criteria. Valid diesel particulate net filter weights shall be accepted according to the following criteria:

(i) During each phase of the UDDS dilute exhaust will be simultaneously sampled by paired primary test and back-up test filters.

(ii) The back-up filter holder shall be located 3 to 4 inches downstream of the primary filter holder.

(iii) The net weight of particulate material collected on each primary test filter and each back-up test filter shall be determined by the procedure outlined in § 86.139.

(iv) A ratio of net weights will be determined by the following formula:

$$\text{Ratio of net weights} = \frac{(\text{Mass Particulate})_{\text{primary filter}}}{(\text{Mass Particulate})_{\text{primary filter}} + (\text{Mass Particulate})_{\text{back up filter}}}$$

(v) If the ratio is greater than 0.95, then particulate emissions calculations are based on the net weight of the primary filter only.

(vi) If the ratio is less than 0.95, then particulate emissions calculations are based on the combined net weights of the back-up test filter and the primary test filter.

(2) The particulate filter must have a minimum 47 mm diameter (37 mm stain area). Larger diameter filters are also acceptable. (Larger diameter filters may be desirable in order to reduce the pressure drop across the filter when testing vehicles which produce large amounts of particulate.)

(3) The recommended minimum loading on the primary 47 mm filter is 0.5 milligrams. Equivalent loadings (i.e., mass/stain area) are recommended for larger filters.

(4) Fluorocarbon coated glass fiber filters or fluorocarbon-based (membrane) filters are required for particulate collection.

[54 FR 14507, Apr. 11, 1989]

§ 86.111–82 Exhaust gas analytical system.

(a) *Schematic drawings.* Figure B82-5 is a schematic drawing of the exhaust gas analytical system. The schematic diagram of the hydroocarbon analysis train for diesel vehicles is shown as part of Figure B82-3 (or Figure B82-4). Since various configurations can produce accurate results, exact conformance with either drawing is not required. Additional components such as instruments, valves, solenoids, pumps and switches may be used to provide additional information and coordinate the functions of the component systems.

(b) *Major component description.* The analytical system, Figure B82-5, consists of a flame ionization detector (FID) for the determination of hydrocarbons, nondispersive infrared analyzers (NDIR) for the determination of carbon monoxide and carbon dioxide and a chemiluminescence analyzer (CL) for the determination of oxides of nitrogen. A heated flame ionization detector (HFID) is used for the continuous determination of hydrocarbons from diesel-fueled vehicles, Figure B82-3 (or B82-4). The exhaust gas analytical system shall conform to the following requirements:

(1) The CL requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator.

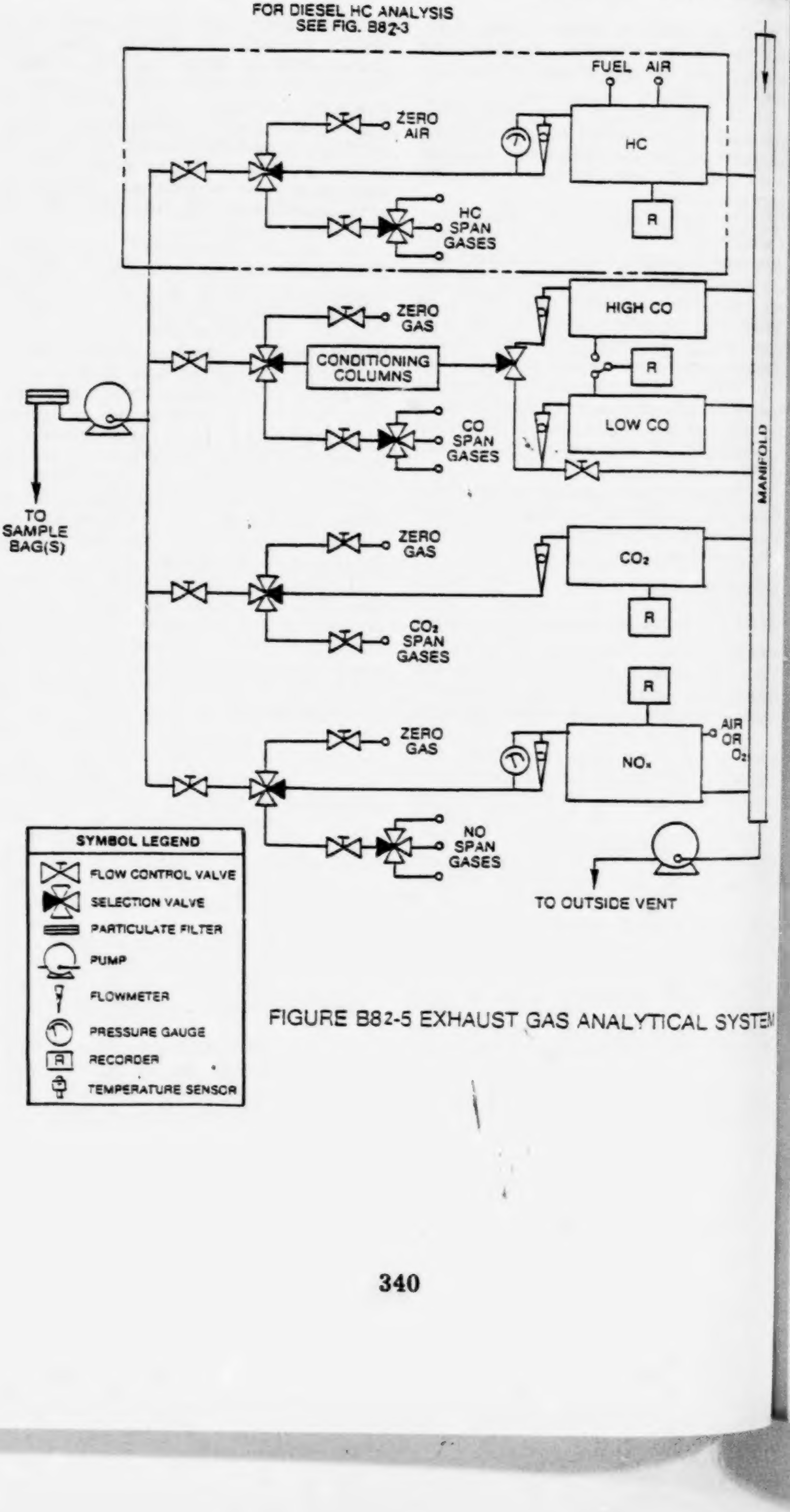

FOR DIESEL HC ANALYSIS
SEE FIG. B82-3
FUEL
AIR
ZERO AIR
HC
R
HC SPAN GASES
ZERO GAS
HIGH CO
CONDITIONING COLUMNS
R
LOW CO
CO SPAN GASES
TO SAMPLE BAG(S)
MANIFOLD
ZERO GAS
CO₂
R
CO₂ SPAN GASES
R
ZERO GAS
NOₓ
AIR OR O₂
NO SPAN GASES
TO OUTSIDE VENT
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
RECORDER
TEMPERATURE SENSOR

FIGURE B82-5 EXHAUST GAS ANALYTICAL SYSTE

(2) The carbon monoxide (NDIR) analyzer may require a sample conditioning column containing $CaSO_4$, or indicating silica gel to remove water vapor and containing ascarite to remove carbon dioxide from the CO analysis stream.

(i) If CO instruments which are essentially free of CO_2 and water vapor interference are used, the use of the conditioning column may be deleted, see §§ 86.122 and 86.144.

(ii) A CO instrument will be considered to be essentially free of CO_2 and water vapor interference if its response to a mixture of 3 percent CO_2 in N_2 which has been bubbled through water at room temperature produces an equivalent CO response, as measured on the most sensitive CO range, which is less than 1 percent of full scale CO concentration on ranges above 300 ppm full scale or less than 3 ppm on ranges below 300 ppm full scale, see § 86.122.

(3) For diesel vehicles a continuous hydrocarbon sample shall be measured using a heated analyzer train as shown in Figure B82-3 (or B82-4). The train shall include a heated probe, a heated continuous sampling line, a heated particulate filter and a heated hydrocarbon instrument (HFID) complete with heated pump, filter and flow control system.

(i) The response time of this instrument shall be less than 1.5 seconds for 90 percent of full scale response.

(ii) The continuous HC sample system may use an "overflow" zero and span system; see § 86.140-82(b)(4). In this type of system (figures B82-3A and B82-4A), zero or span gas is introduced into the heated sample line at a flow rate that exceeds the sample flow rate to the HFID. The excess gas overflows the sample probe into the dilution tunnel. This method assures that the reference gas enters the HFID in the same concentration as the injected reference gas and at the same rate as the sample exhaust gas. In addition to zero and span checks, it may also be used to calibrate the HC analyzer per § 86.121-82(b). The overflow gas flow rate into the sample line shall be greater than 125 percent of the HFID flow rate with the CVS blower operating. A lower flow rate may be used if it has been experimentally shown to produce equivalent results and current documentation is maintained. The overflow gases shall enter the heated sample line as close as practicable to the outside surface of the dilution tunnel.

(iii) No other analyzers may draw a sample from the continuous HC sample probe, line or system, unless a common sample pump is used for all analyzers and the single sample line system design reflects good engineering practice.

(iv) Sample transport time from sampling point to inlet of instrument shall be less than 4 seconds.

(v) The sample line and filter shall be heated to maintain a sample gas temperature of 375±10 °F (191±6 °C) before the filter and before the HFID.

(c) *Other analyzers and equipment.* Other types of analyzers and equipment may be used if shown to yield equivalent results and if approved in advance by the Administrator.

[45 FR 14513, Mar. 5, 1980, as amended at 54 FR 2121, Jan. 19, 1989]

§ 86.111-90 Exhaust gas analytical system.

(a) *Schematic drawings.* Figure B90-7 is a schematic drawing of the exhaust gas analytical system for analysis of hydrocarbons (HC) (hydrocarbons plus methanol in the case of methanol-fueled vehicles), carbon monoxide (CO), carbon dioxide (CO_2), and oxides of nitrogen (NOx). The schematic diagram of the hydrocarbon analysis train for diesel vehicles (and for hydrocarbons plus methanol for methanol-fueled diesel vehicles if continuous HFID analysis is employed) is shown as part of Figure B90-5 (or Figure B90-6). Since various configurations can produce accurate results, exact conformance with either drawing is not required. Additional components such as instruments, valves, solenoids, pumps and switches may be used to provide additional information and coordinate the functions of the component systems.

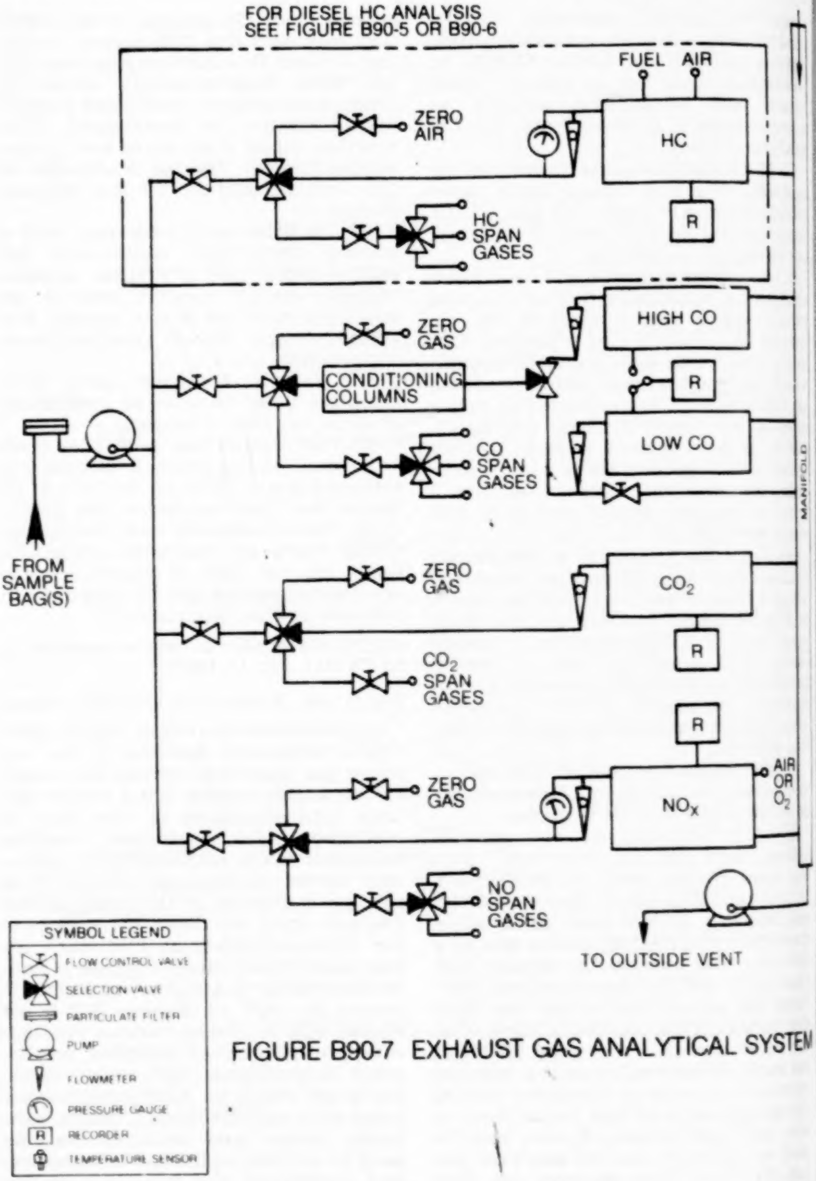

FOR DIESEL HC ANALYSIS
SEE FIGURE B90-5 OR B90-6
FUEL
AIR
ZERO AIR
HC
R
HC SPAN GASES
HIGH CO
ZERO GAS
CONDITIONING COLUMNS
R
LOW CO
CO SPAN GASES
MANIFOLD
FROM SAMPLE BAG(S)
ZERO GAS
CO_2
R
CO_2 SPAN GASES
R
AIR OR O_2
ZERO GAS
NO_X
NO SPAN GASES
TO OUTSIDE VENT
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
R RECORDER
TEMPERATURE SENSOR

FIGURE B90-7 EXHAUST GAS ANALYTICAL SYSTEM

(b) *Major component description.* The exhaust gas analytical system for HC, CO, CO_2, and NOx, Figure B90-7, consists of a flame ionization detector (FID) (heated, 235°±15°F (113°±8°C) for methanol-fueled vehicles) for the determination of hydrocarbons, nondispersive infrared analyzers (NDIR) for the determination of carbon monoxide and carbon dioxide and a chemiluminescence analyzer (CL) for the determination of oxides of nitrogen. A heated flame ionization detector (HFID) is used for the continuous determination of hydrocarbons from petroleum-fueled diesel vehicles (may also be used with methanol-fueled diesel vehicles), Figure B90-5 (or B90-6). The analytical system for methanol consists of a gas chromatograph (GC) equipped with a flame ionization detector. The analysis for formaldehyde is performed using high pressure liquid chromatography (HPLC) of 2,4-dinitrophenylhydrazine (DNPH) derivatives using ultraviolet (UV) detection. The exhaust gas analytical system shall conform to the following requirements:

(1) The CL requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(2) The carbon monoxide (CO) NDIR analyzer may require a sample conditioning column containing $CaSO_4$, or indicating silica gel to remove water vapor and containing ascarite to remove carbon dioxide from the CO analysis stream.

(i) If CO instruments which are essentially free of CO_2 and water vapor interference are used, the use of the conditioning column may be deleted, see §§ 86.122 and 86.144.

(ii) A CO instrument will be considered to be essentially free of CO_2 and water vapor interference if its response to a mixture of 3 percent CO_2 in N_2 which has been bubbled through water at room temperature produces an equivalent CO response, as measured on the most sensitive CO range, which is less than 1 percent of full scale CO concentration on ranges above 300 ppm full scale or less than 3 ppm on ranges below 300 ppm full scale, see § 86.122.

(3) For petroleum-fueled diesel vehicles (and if selected, for methanol-fueled diesel vehicles) a continuous hydrocarbon sample shall be measured using a heated analyzer train as shown in Figure B90-5 (or B90-6). The train shall include a heated probe, a heated continuous sampling line, a heated particulate filter and a heated hydrocarbon instrument (HFID) complete with heated pump, filter and flow control system.

(i) The response time of this instrument shall be less than 1.5 seconds for 90 percent of full scale response.

(ii) The continuous HC sample system may use an "overflow" zero and span system; see § 86.140-82(b)(4). In this type of system (figures B82-3A and B82-4A), zero or span gas is introduced into the heated sample line at a flow rate that exceeds the sample flow rate to the HFID. The excess gas overflows the sample probe into the dilution tunnel. This method assures that the reference gas enters HFID in the same concentration as the injected reference gas and at the same rate as the sample exhaust gas. In addition to zero and span checks, it may also be used to calibrate the HC analyzer per § 86.121-82(b). The overflow gas flow rate into the sample line shall be greater than 125 percent of the HFID flow rate with the CVS blower operating. A lower flow rate may be used if it has been experimentally shown to produce equivalent results and current documentation is maintained. The overflow gases shall enter the heated sample line as close as practicable to the outside surface of the dilution tunnel.

(iii) No other analyzers may draw a sample from the continuous HC sample probe, line or system, unless a common sample pump is used of all analyzers and the single sample line system design reflects good engineering practice.

(iv) Sample transport time from sampling point to inlet of instrument shall be less than 4 seconds.

(v) For petroleum-fueled diesel vehicles, the sample line and filter shall be heated to maintain a sample gas temperature of 375°±10°F (191°±6°C) before the filter and before the HFID.

(vi) For methanol-fueled diesel vehicles, the sample line and filter shall be heated to maintain a sample gas temperature of 235°±15°F (113°±8°C) before the filter and before the HFID.

(c) *Other analyzers and equipment.* Other types of analyzers and equipment may be used if shown to yield equivalent results and if approved in advance by the Administrator.

[54 FR 14512, Apr 11, 1989]

§ 86.112-82 Weighing chamber (or room) and microgram balance specifications.

(a) *Ambient conditions*—(1) *Temperature.* The temperature of the chamber in which the particulate filters are conditioned and weighed shall be maintained to within ± 10° F (6° C) of a set point between 68° F (20° C) and 86° F (30° C) during all filter conditioning and filter weighing. A continuous recording of the temperature is required.

(2) *Humidity.* The relative humidity of the chamber in which the particulate filters are conditioned and weighed shall be maintained to within ± 10 percent of a set point between 30 and 70 percent during all filter conditioning and filter weighing. A continuous recording of the temperature is required.

(3) The environment shall be free from any ambient contaminants (such as dust) that would settle on the particulate filters during their stabilization.

(4) It is required that two reference filters remain in the weighing room at all times, and that these filters be weighed once each 24-hour period.

(5) If the weight of each or both of these two reference filters changes by more than ±2.0 percent of the nominal filter loading (recommended minimum of 0.5 milligrams) during the 24-hour period, then all filter weighings taken during the 24-hour period are invalid.

(6) Filters in the process of being stabilized during this period should be discarded. The reference filters shall be changed at least once per month.

(b) *Microgram balance specifications.* The microgram balance used to determine the weights of all filters shall have a precision (standard deviation) and a readability of one microgram.

[45 FR 14515, Mar. 5, 1980, as amended at 52 FR 47868, Dec. 16, 1987]

§ 86.113-82 Fuel specifications.

(a) *Gasoline.* (1) Gasoline having the following specifications will be used by the Administrator in exhaust and evaporative emission testing. Gasoline having the following specification or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust and evaporative testing except that the lead and octane specifications do not apply.

Item	ASTM	Leaded	Unlead
Octane, research, minimum	D2699	98	9
Sensitivity, minimum		7.5	7.
Lead (organic), grams/U.S. gallon		[1] 1.4	0.00-0
Distillation Range:			
IBP[2], °F	D86	75-95	75-9
10 pct point, °F	D86	120-135	120-13
50 pct point, °F	D86	200-230	200-23
90 pct point, °F	D86	300-325	300-32
EP, °F (maximum)	D86	415	41
Sulfur, weight percent, maximum	D1266	0.10	0.1
Phosphorus, grams/U.S. gallon, maximum		0.01	0.00
RVP[3] [4] pounds per square inch	D323	8.7-9.2	8.7-9.
Hydrocarbon composition:			
Olefins, percent, maximum	D1319	10	1
Aromatics, percent maximum	D1319	35	3
Saturates	D1319	([5])	(

[1] Minimum.

[2] For testing at altitudes above 1,219 m (4,000 ft) the specified range is 75-105.

[3] For testing which is unrelated to evaporative emission control, the specified range is 8.0-9.2.

[4] For testing at altitudes above 1,219 m (4,000 ft) the specified range is 7.9-9.2.

[5] Remainder.

(2) Gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation.

(i) For leaded fuel, the minimum lead content shall be equal to the average lead content found in regular leaded gasoline in the fuel survey prescribed by the Administrator.

(ii) Where the Administrator determines that vehicles represented by a test vehicle will be operated using gasoline of different lead content than that prescribed in this paragraph, he may consent in writing to use a gasoline with a different lead content.

(iii) The octane rating of the gasoline used shall be no higher than one octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers for unleaded fuel and 7.0 octane numbers for leaded fuel, where sensitivity is defined as the Research octane number minus the Motor octane number.

(iv) The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(3) The specification range of the gasoline to be used under paragraph (a)(2) of this section shall be reported in accordance with § 86.079-21(b)(3).

(b) *Diesel fuel.* (1) The diesel fuels employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, and dispersant.

(2) Diesel fuel meeting the following pecifications, or substantially equivaent specifications approved by the Administrator, shall be used in exhaust mission testing. The grade of diesel uel recommended by the engine manfacturer, commercially designated as Type 2D" grade diesel, shall be used.

Item	ASTM test method No.	Type 2-D
etane Number	D613, D86	42-50
stillation range:		
BP, °F		340-400
10 percent point, °F		400-460
50 percent point, °F		470-540
90 percent point, °F		550-610
EP, °F		580-660
Gravity, °AP1	D287	33-37
Total sulfur, percent	D129 or D2622	0.2-0.5
Hydrocarbon composition	D1319	
Aromatics, percent (minimum).		27
Paraffins, naphthenes, olefins.		(1)
Flashpoint, °F (minimum)	D93	130
Viscosity, centistokes	D445	2.0-3.2

[1] Remainder.

(3) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of diesel fuel recommended by the engine manufacturer, commercially, designated as "Type 2-D" grade diesel fuel, shall be used.

Item	ASTM test method No.	Type 2-D
Cetane Number	D613	38-58
Distillation range:		
90 percent point °F	D86	430-630
Gravity °API	D287	30-42
Total sulfur, percent (minimum).	D129 or D2622	0.2
Flashpoint, °F (minimum)	D93	130
Viscosity, centistokes	D455	1.5-4.5

(4) Other petroleum distillate fuel specifications:

(i) Other petroleum distillate fuels may be used for testing and service accumulation provided they are commercially available, and

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(iii) Use of a fuel listed under paragraphs (b) (2) and (3) of this section would have a detrimental effect on emissions or durability, and

(iv) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (b) (2), (3), and (4) of this section shall be reported in accordance with §86.078-21(b)(3).

(c) Fuels not meeting the specifications set forth in this section may be used only with the advance approval of the Administrator.

(Approved by the Office of Management and Budget under control number 2000-0390)

[46 FR 50493, Oct. 13, 1981; 47 FR 49807, Nov. 2, 1982, as amended at 49 FR 48138, Dec. 10, 1984]

§ 86.113-87 Fuel specifications.

(a) *Gasoline.* (1) Gasoline having the following specifications will be used by the Administrator in exhaust and evaporative emission testing. Gasoline having the following specification or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust and evaporative testing except that the octane specification does not apply.

Item	ASTM	Leaded	Unleaded
Octane, research, min.	D2699	98	93
Sensitivity, min.		7.5	7.5
Lead (organic), g/U.S. gal (g/liter).	D3237	[1]0.100 [1] (0.026)	[1]0.050 [1] (0.013)
Distillation Range:			
IBP[2], °F	D86	75-95	75-95
(°C)		(23.9-35)	(23.9-35)
10 pct. point, °F.	D86	120-135	120-135
(°C)		(48.9-57.2)	(48.9-57.2)
50 pct. point, °F.	D86	200-230	200-230
(°C)		(93.3-110)	(93.3-110)
90 pct. point, °F.	D86	300-325	300-325
(°C)		(148.9-162.8)	(148.9-162.8)
EP, °F, max.	D86	415	415
(°C)		(212.8)	(212.8)
Sulfur, wt. pct., max.	D1266	0.10	0.10
Phosphorus, g/U.S. gal., max. (g/liter.		0.01 (0.0026)	0.005 (0.0013)
RVP [3 4], psi.	D323	8.7-9.2	8.7-9.2
(kPa)		(60.0-63.4)	(60.8-63.4)
Hydrocarbon composition:			
Olefins, pct., max.	D1319	10	10
Aromatics, pct, max.	D1319	35	35
Saturates	D1319	([5])	([5])

[1] Maximum.

[2] For testing at altitudes above 1,219 m (4,000 ft), the specified range is 75-105 °F (23.9-40.6 °C).

[3] For testing which is unrelated to evaporative emission control, the specified range is 8.0-9.2 psi (55.2-63.4 kPa).

[4] For testing at altitudes above 1,219 m (4,000 ft), the specified range is 7.9-9.2 psi (54.4-63.4 kPa).

[5] Remainder.

(2) Gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation.

(i) For leaded fuel, the lead content shall not exceed 0.100 gram lead per gallon leaded gasoline (0.026 g/liter).

(ii) Where the Administrator determines that vehicles represented by a test vehicle will be operated using gasoline of different lead content than that prescribed in this paragraph, he may consent in writing to use a gasoline with a different lead content.

(iii) The octane rating of the gasoline used shall be no higher than one research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers for unleaded fuel and 7.0 octane numbers for leaded fuel, where sensitivity is defined as the Research octane number minus the Motor octane number.

(iv) The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(3) The specification range of the gasoline to be used under paragraph (a)(2) of this section shall be reported in accordance with § 86.085-21(b)(3).

(b) *Diesel fuel.* (1) The diesel fuels employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, and dispersant.

(2) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emission testing. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as "Type 2-D" grade diesel, shall be used

Item	ASTM Test Method No.	Type 2-D
Cetane Number	D613, D86	42–50
Distillation range:		
IBP, °F		340–400
(°C)		(171.1–204.4)
10 pct. point, °F		400–460
(°C)		(204.4–237.8)
50 pct. point, °F		470–540
(°C)		(243.3–282.2)
90 pct. point, °F		550–610
(°C)		(287.8–321.1)
EP, °F		580–660
(°C)		(304.4–348.9)
Gravity, °API	D287	33–37
Total sulfur, pct	D129 or D2622	0.2–0.5
Hydrocarbon composition.	D1319	
Aromatics, pct., min		27
Paraffins, naphthenes, olefins.		[1]
Flashpoint, °F, min	D93	130
(°C)		(54.4)
Viscosity, centistokes	D445	2.0–3.2

[1] Remainder.

(3) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as "Type 2-D" grade diesel fuel, shall be used.

Item	ASTM Test Method No.	Type 2-D
Cetane Number	D613	38–58
Distillation range:		
90 pct. point °F	D86	430–630
(°C)		(221.1–332.2)
Gravity, °API	D287	30–42
Total sulfur, pct., min	D129 or D2622	0.20
Flashpoint, °F, min.	D93	130
(°C)		(54.4)
Viscosity, centistokes	D455	1.5–4.5

(4) Other petroleum distillate fuel specifications:

(i) Other petroleum distillate fuels may be used for testing and service accumulation provided they are commercially available, and

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(iii) Use of fuel listed under paragraphs (b)(2) and (b)(3) of this section would have a detrimental effect on emissions or durability, and

(iv) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (b) (2), (3), and (4) of this section shall be reported in accordance with § 86.085-21(b)(3).

(c) Fuels not meeting the specifications set forth in this section may be used only with the advance approval of the Administrator.

[51 FR 24610, July 7, 1986]

§ 86.113–90 Fuel specifications.

(a) *Otto-cycle test fuel.* (1) Gasoline having the following specifications will be used by the Administrator in exhaust and evaporative emission testing of petroleum fueled Otto-cycle vehicles. Gasoline having the following specification or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust and evaporative testing except that octane specifications do not apply.

Item		ASTM test method No.	Value
Octane, research	min.	D2699	93
Sensitivity	min.		7.5
Lead (organic)	g/U.S.gal.	D3237	[1]0.050
	(g/liter)		[1](0.013)
Distillation range:			
IBP [2]	°F	D86	75–95
	(°C)		(23.9–35)
10 pct. point	°F	D86	120–135
	(°C)		(48.9–57.2)
50 pct. point	°F	D86	200–230
	(°C)		(93.3–110)
90 pct. point	°F	D86	300–325
	(°C)		(148.9–162.8)
EP (max.)	°F	D86	415
	(°C)		(212.8)

Item		ASTM test method No.	Value
Sulfur, weight pct	max.	D1266	0.1
Phosphorus, max	g/U.S. gal. (g/liter)	D3231	0.00 (0.001
RVP [3] [4]	psi (kPa)	D3231	8.7–9. (60.0–63.
Hydrocarbon composition:			
Olefins	max. pct.	D1319	1
Aromatics	max. pct.	D1319	3
Saturates		D1319	

[1] Maximum.

[2] For testing at altitudes above 1,219 m (4,000 ft) the specified range is 75°–105 °F (23.9°–40.6 °C).

[3] For testing which is unrelated to evaporative emission control, the specified range is 8.0–9.2 psi (55.2–63.4 kPa

[4] For testing at altitudes above 1,219 m (4,000 ft) the specified range is 7.9–9.2 psi (54.5–63.4 kPa).

[5] Remainder.

(2) Unleaded gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation for petroleum-fueled Otto-cycle vehicles. Leaded gasoline will not be used in service accumulation.

(i) The octane rating of the gasoline used shall be no higher than 1.0 Research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers, where sensitivity is defined as the Research octane number minus the Motor octane number.

(ii) The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(3) Methanol fuel used for exhaust and evaporative emission testing and in service accumulation of methanol-fueled Otto-cycle vehicles shall be representative of commercially available methanol fuel and shall consist of at least 50 percent methanol by volume.

(i) Manufacturers shall recommend the methanol fuel to be used for testing and service accumulation in accordance with paragraph (a)(3) of this section.

(ii) The Administrator shall determine the methanol fuel to be used for testing and service accumulation.

(4) Other methanol fuels may be used for testing and service accumulation provided:

(i) They are commercially available, and

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(iii) Use of a fuel listed under paragraph (a)(3) of this section would have a detrimental effect on emissions or durability, and

(iv) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (a)(2), (a)(3), and (a)(4) of this section shall be reported in accordance with § 86.090-21(b)(3).

(b) *Diesel test fuel.* (1) The petroleum fuels employed for testing diesel vehicles shall be clean and bright, with pour and cloud points adequate for operability. The petroleum fuel may contain nonmetallic additives as follows: cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, dispersant and biocide.

(2) Petroleum fuel for diesel vehicles meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emission testing. The grade of petroleum fuel recommended by the engine manufacturer, commercially designated as "Type 2-D" grade diesel, shall be used.

Item		ASTM test method No.	Type 2-D
Cetane number		D613	42-50
Distillation range:			
IBP	°F	D86	340-400
	(°C)		(171.1-204.4)
10 pct. point	°F	D86	400-460
	(°C)		(204.4-237.8)
50 pct. point	°F	D86	470-540
	(°C)		(243.3-282.2)
90 pct. point	°F	D86	550-610
	(°C)		(287.8-321.1)
EP	°F	D86	580-660
	(°C)		(304.4-348.9)
Gravity	°API	D287	33-37
Total sulfur	pct.	D129, or D2622	0.2-0.5
Hydrocarbon composition:			
Aromatics, min.	pct.	D1319	27
Paraffins, naphthenes, olefins			[1]
Flashpoint, min.	°F	D93	130
	(°C)		(54.4)
Viscosity, centistokes		D445	2.0-3.2

[1] Remainder.

(3) Petroleum fuel for diesel vehicles meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of petroleum diesel fuel recommended by the engine manufacturer, commercially designated as "Type 2-D" grade diesel fuel, shall be used.

Item		ASTM test method No.	Type 2-D
Cetane number		D613	38-58
Distillation range:			
90 pct. point	°F	D86	430-630
	(°C)		(221.1-332.2)
Gravity	°API	D287	30-42
Total sulfur	min., pct.	D129 or D2622	0.20
Flashpoint, min.	°F	D93	130
	(°C)		(54.4)
Viscosity	centistokes	D455	1.5-4.5

(4) Methanol fuel used for exhaust and evaporative emission testing and in service accumulation of methanol-fueled diesel vehicles shall be representative of commercially available methanol fuel and shall consist of at least 50 percent methanol by volume.

(i) Manufacturers shall recommend the methanol fuel to be used for testing and service accumulation in accordance with paragraph (b)(4) of this section.

(ii) The Administrator shall determine the methanol fuel to be used for testing and service accumulation.

(5) Other fuels may be used for testing and service accumulation provided:

(i) They are commercially available, and

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(iii) Use of a fuel listed under paragraphs (b)(2) and (b)(3) or (b)(4) of this section would have a detrimental effect on emissions or durability, and

(iv) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(6) The specification range of the fuels to be used under paragraphs (b)(2), (b)(3), (b)(4), and (b)(5) of this section shall be reported in accordance with § 86.090-21(b)(3).

(c) Fuels not meeting the specifications set forth in this section may be used only with the advance approval of the Administrator.

(d) *Mixtures of petroleum and methanol fuels for flexible fuel vehicles.* (1) Mixtures of petroleum and methanol fuels used for exhaust and evaporative emission testing and service accumulation for flexible fuel vehicles shall be within the range of fuel mixtures for which the vehicle was designed.

(2) Manufacturer testing and service accumulation may be performed using only those mixtures (mixtures may be different for exhaust testing, evaporative testing, and service accumulation) expected to result in the highest emissions, provided:

(i) The fuels which constitute the mixture will be used in customer service, and

(ii) Information, acceptable to the Administrator, is provided by the manufacturer to show that the designated fuel mixtures would result in the highest emissions, and

(iii) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(3) The specification range of the fuels to be used under paragraph (d)(1) of this section shall be reported in accordance with § 86.090-21(b)(3).

[54 FR 14514, Apr. 11, 1989]

§ 86.114-79 Analytical gases.

(a) Analyzer gases.

(1) Gases for the CO and CO_2 analyzers shall be single blends of CO and CO_2 respectively using nitrogen as the diluent.

(2) Gases for the hydrocarbon analyzer shall be single blends of propane using air as the diluent.

(3) Gases for NO_x analyzer shall be single blends of NO named as NO_x, with a maximum NO_2 concentration of 5 percent of the nominal value, using nitrogen as the diluent.

(4) Fuel for the evaporative emission enclosure FID shall be a blend of 40±2% hydrogen with the balance being helium. The mixture shall contain less than 1 ppm equivalent carbon response. 98 to 100 percent hydrogen fuel may be used with advance approval by the Administrator.

(5) The allowable zero gas (air or nitrogen) impurity concentrations shall not exceed 1 ppm equivalent carbon response, 1 ppm carbon monoxide, 0.04 percent (400 ppm) carbon dioxide and 0.1 ppm nitric oxide.

(6) "Zero grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

(7) The use of precision blending devices (gas dividers) to obtain the required calibration, as defined below, is acceptable, provided that the calibration curver they produce name a calibration gas within 2 percent of its certified concentration. This verification shall be performed at between 15 and 50 percent of the full scale concentration of the range and shall be included with each gas calibration incorporating a blending device. Alternative procedures to verify the validity of the analyzer calibration curves generated using a gas divider are acceptable provided the procedures are approved in advance by the Administrator.

(b) Calibration gases shall be traceable to within 1 percent of NBS gas standards, or other gas standards which have been approved by the Administrator.

(c) Span gases shall be accurate to within 2 percent of true concentration where true concentration refers to NBS gas standards, or other gas standards which have been approved by the Administrator.

[42 FR 32954, June 28, 1977, as amended at 43 FR 52920, Nov. 14, 1978; 54 FR 2121, Jan. 19, 1989]

§ 86.115-78 EPA urban dynamometer driving schedule.

(a) The dynamometer driving schedule is listed in Appendix I. The driving schedule is defined by a smooth trace drawn through the specified speed vs. time relationships. It consists of a nonrepetitive series of idle, acceleration cruise, and deceleration modes of various time sequences and rates.

(b)(1) The dynamometer driving schedule is prescribed in appendix I. The speed tolerance at any given time for this schedule, or for a driver's aid chart approved by the Administrator, when conducted to meet the provisions of § 86.137 are:

(i) The upper limit is 2 mph (3.2 km/h) higher than the highest point on the trace within 1 second of the given time.

(ii) The lower limit is 2 mph (3.2 km/h) lower than the lowest point on the trace within 1 second of the given time.

(iii) Speed variations greater than the tolerances (such as may occur during gear changes) are acceptable provided they occur for less than 2 seconds on any occasion.

(iv) Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power during such occurrences.

(v) When conducted to meet the requirements of § 86.132, the speed tolerance shall be as specified above, except the upper and lower limits shall be 4 mph (6.4 km/h).

(c) Figures B78-4(a) and B78-4(b) show the range of acceptable speed tolerances for typical points. Figure B78-4(a) is typical of portions of the speed curve which are increasing or decreasing throughout the 2-second time interval. Figure B78-4(b) is typical of portions of the speed curve which include a maximum or minimum value.

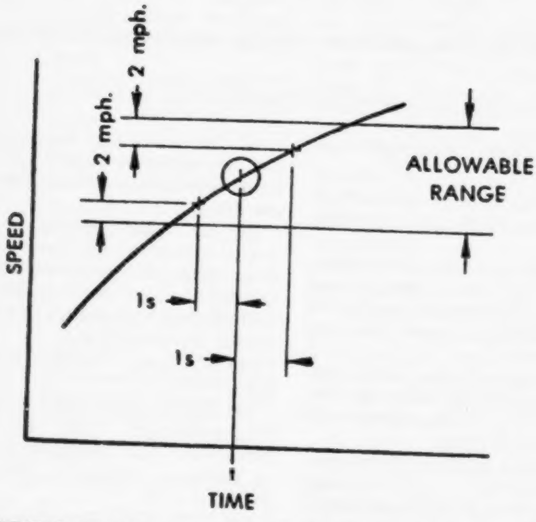


FIGURE B78-4a—DRIVERS TRACE, ALLOWABLE RANGE

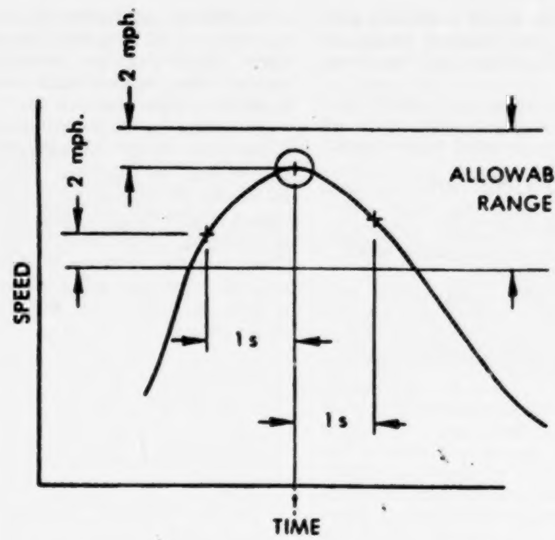


FIGURE B78-4b—DRIVERS TRACE, ALLOWABLE RANGE

[42 FR 32954, June 28, 1977, as amended at 43 FR 52920, Nov. 14, 1978]

§ 86.116-82 Calibrations, frequency and overview.

(a) Calibrations shall be performed as specified in §§ 86.117 through 86.126.

(b) At least yearly or after any maintenance which could alter background emission levels, evaporative enclosure background emission measurements shall be performed.

(c) At least monthly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Calibrate the hydrocarbon analyzers (both evaporative and exhaust instruments), carbon dioxide analyzer, carbon monoxide analyzer, and oxides of nitrogen analyzer.

(2) *Calibrate the dynamometer.* If the dynamometer receives a weekly performance check (and remains within calibration) the monthly calibration need not be performed.

(3) Perform a hydrocarbon retention check and calibration on the evaporative emission enclosure.

(4) Calibrate the gas meters or flow instrumentation used for providing total flow measurement for particulate sampling.

(d) At least weekly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Check the oxides of nitrogen converter efficiency, and

(2) Perform a CVS system verification.

(3) Run a performance check on the dynamometer. This check may be omitted if the dynamometer has been calibrated within the preceding month.

(e) The CVS positive displacement pump or Critical Flow Venturi shall be calibrated following initial installation, major maintenance or as necessary when indicated by the CVS system verification (described in § 86.119).

(f) Sample conditioning columns, if used in the CO analyzer train, should be checked at a frequency consistent with observed column life or when the indicator of the column packing begins to show deterioration.

[45 FR 14515, Mar. 5, 1980]

§ 86.116-90 Calibrations, frequency and overview.

(a) Calibrations shall be performed as specified in § 86.117 through § 86.126.

(b) At least yearly or after any maintenance which could alter background emission levels, evaporative enclosure background emission measurements shall be performed.

(c) At least monthly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Calibrate the hydrocarbon analyzers (both evaporative and exhaust instruments), carbon dioxide analyzer, carbon monoxide analyzer, oxides of nitrogen analyzer, methanol analyzer, and formaldehyde analyzer (certain analyzers may require more frequent calibration depending on particular equipment and uses).

(2) Calibrate the dynamometer. If the dynamometer receives a weekly performance check (and remains within calibration) the monthly calibration need not be performed.

(3) Perform a hydrocarbon and methanol (if methanol fuel is used) retention check and calibration on the evaporative emission enclosure.

(4) Calibrate the gas meters or flow instrumentation used for providing total flow measurement for particulate sampling.

(d) At least weekly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Check the oxides of nitrogen converter efficiency, and

(2) Perform a CVS system verification.

(3) Run a performance check on the dynamometer. This check may be omitted if the dynamometer has been calibrated within the preceeding month.

(e) The CVS positive displacement pump or Critical Flow Venturi shall be calibrated following initial installation, major maintenance, or as necessary when indicated by the CVS system verification (described in § 86.119).

(f) Sample conditioning columns, if used in the CO analyzer train, should be checked at a frequency consistent with observed column life or when the indicator of the column packing begins to show deterioration.

[54 FR 14516, Apr. 11, 1989]

§ 86.117-78 Evaporative emission enclosure calibrations.

The calibration of the evaporative emission enclosure consists of three parts: Initial and periodic determination of enclosure background emissions; initial determination of enclosure internal volume; and periodic hydrocarbon retention check and calibration.

(a) *Initial and periodic determination of enclosure background emissions.* Prior to its introduction into service, annually thereafter, and after any repair which can affect the enclosure background emissions, the enclosure shall be checked to determine that it does not contain materials which will themselves emit hydrocarbons. Proceed as follows:

(1) Zero and span (calibrate if required) the hydrocarbon analyzer.

(2) Purge the enclosure until a stable background hydrocarbon reading is obtained.

(3) Turn on the mixing blower (if not already on).

(4) Seal enclosure and measure background hydrocarbon concentration, temperature, and barometric pressure. These are the initial readings C_{HCi}, T_i and P_{Bi} for the enclosure background determination.

(5) Allow the enclosure to stand undisturbed without sampling for four hours.

(6) Measure the hydrocarbon concentration on the same FID. This is the final concentration, C_{HCf}. Also measure final temperature and barometric pressure.

(7) Calculate the mass change of hydrocarbons in the enclosure according to the equations in paragraph (d) of this section. The enclosure background emissions shall not be greater than 0.4g for the 4 hours.

(b) *Initial determination of enclosure internal volume.* Prior to its introduction into service the enclosure internal volume shall be determined by the following procedure.

(1) Carefully measure the internal length, width and height of the enclosure, accounting for irregularities (such as braces) and calculate the internal volume.

(2) Perform an enclosure calibration check according to paragraphs (c) (1) through (7) of this section.

(3) If the calculated mass does not agree within 2 percent of the injected propane mass, then corrective action is required.

(c) *Hydrocarbon retention check and calibration.* The hydrocarbon retention check provides a check upon the calculated volume and also measures the leak rate. Prior to its introduction into service and at least monthly thereafter the enclosure leak rate shall be determined as follows:

(1) Zero and span (calibrate if required) the hydrocarbon analyzer.

(2) Purge the enclosure until a stable background hydrocarbon reading is obtained.

(3) Turn on the mixing blower (if not already on).

(4) Seal enclosure and measure background hydrocarbon concentration, temperature and barometric pressure. These are the initial readings C_{HCi}, T_i and P_{Bi} for the enclosure calibration.

(5) Inject into the enclosure a known quantity of pure propane. (4 g is a convenient quantity.) The propane may be measured by volume flow or by mass measurement. The method used to measure the propane shall have an accuracy and precision of ±0.5 percent of the measured value.

(6) After a minimum of 5 minutes of mixing, analyze the enclosure atmosphere for hydrocarbon content, also record temperature and pressure. These measurements are the final readings for the enclosure calibration as well as the initial readings for the retention check.

(7) To verify the enclosure calibration calculate the mass of propane using the measurements taken in steps (4) and (6). See paragraph (d) of this section. This quantity must be within ±2 percent of that measured in step above.

(8) Allow the enclosure to remai sealed for a minimum of 4 hours without sampling and with the mixin blower operating. After 4 hours analyze the enclosure atmosphere for hydrocarbon content; record temperature and barometric pressure. These are the final readings for the hydrocarbon retention check.

(9) Calculate, using the equations in paragraph (d) of this section and the readings taken in (8), the hydrocarbon mass. It may not differ by more than percent of the value in step (6).

(d) *Calculations.* The calculation of net hydrocarbon mass change is used to determine enclosure background and leak rate. It is also used to check the enclosure volume measurements. The mass change is calculated from the initial and final readings of hydrocarbon concentration, temperature and pressure according to the following equation:

$$M_{HC}=kV\times10^{-4}[(C_{HCf}P_{Bf}/T_f)-(C_{HCi}P_{Bi}/T_i)]$$

where:

M_{HC}=Hydrocarbon mass change, g.
C_{HC}=Hydrocarbon concentration as ppm carbon.
V=Enclosure volume, ft^3 (m^3), as measured in paragraph (b)(1) of this section.
P_B=Barometric pressure, in. Hg (kPa).
T=Enclosure ambient temperature, R(K
k=3.05.

for SI units,

k=17.60.
i=Indicates initial reading.
f=Indicates final reading.

NOTE: Hydrocarbon concentration is stated in ppm carbon, that is, ppm propane x3. Expressions in parenthesis are for SI units.

§ 86.117-90 Evaporative emission enclosure calibrations.

The calibration of the evaporative emission enclosure consists of three parts: Initial and periodic determination of enclosure background emissions (hydrocarbons and methanol); initial determination of enclosure internal volume; and periodic hydrocarbon and methanol retention check and calibration. Methanol measurements may be omitted when methanol-fueled vehicles will not be tested in the evaporative enclosure.

(a) *Initial and periodic determination of enclosure background emissions.* Prior to its introduction into service, annually thereafter, and after any repair which can affect the enclosure background emissions, the enclosure shall be checked to determine that it does not contain materials which will themselves emit hydrocarbons or methanol.* Proceed as follows:

*Note: When methanol as well as hydrocarbons are present in the evaporative enclosure, the HFID hydrocarbon concentration measurement includes the partial response of the HFID to methanol plus the hydrocarbons. Determination of the HFID response to methanol, § 86.121, prior to its being placed in service is required for the determination of hydrocarbons.

(1) Zero and span (calibrate if required) the hydrocarbon analyzer.

(2) Purge the enclosure until a stable background hydrocarbon reading is obtained.

(3) Turn on the mixing blower (if not already on).

(4) Seal enclosure and measure background hydrocarbon concentration, background methanol, temperature, and barometric pressure. These are the initial readings C_{HCi}, C_{CH3OHi}, and P_{Bi}, T_i, for the enclosure background determination.

(5) Allow the enclosure to stand undisturbed without sampling for four hours.

(6) Measure the hydrocarbon concentration on the same FID and the methanol level. These are the final concentrations, C_{HCf} and C_{CH3OHf}. Also measure final temperature and barometric pressure.

(7) Calculate the mass change of methanol, hydrocarbons, and hydrocarbons plus methanol in the enclosure according to the equations in paragraph (d) of this section. The enclosure background emissions (hydrocarbons plus methanol) shall not be greater than 0.4g for the 4 hours.

(b) *Initial determination of enclosure internal volume.* Prior to its introduction into service the enclosure internal volume shall be determined by the following procedure:

(1) Carefully measure the internal length, width and height of the enclosure, accounting for irregularities (such as braces) and calculate the internal volume.

(2) Perform an enclosure calibration check according to paragraphs (c) (1) through (7) of this section.

(3) If the calculated mass does not agree within 2 percent of the injected propane mass, then corrective action is required.

(c) *Hydrocarbon and methanol retention check and calibration.* The hydrocarbon and methanol (if the enclosure is used for methanol-fueled vehicles) retention check provides a check upon the calculated volume and also measures the leak rate. Prior to its introduction into service and at least monthly thereafter the enclosure leak rate shall be determined as follows:

(1) Zero and span (calibrate if required) the hydrocarbon analyzer.

(2) Purge the enclosure until a stable background hydrocarbon reading is obtained.

(3) Turn on the mixing blower (if not already on).

(4) Seal enclosure and measure background hydrocarbon concentration, background methanol, temperature, and barometric pressure. These are the initial readings C_{HCi}, C_{CH3OHi}, T_i and P_{Bi} for the enclosure calibration.

(5) Inject into the enclosure a known quantity of pure propane (4g is a convenient quantity) and a known quantity of pure methanol (4g is a convenient quantity) in gaseous form; i.e., at a temperature of at least 150-155°F (65-68°C). The propane and methanol may be measured by volume flow or by mass measurement. The method used to measure the propane and methanol shall have an accuracy and precision of ±0.5 percent of the measured value.

(6) After a minimum of 5 minutes of mixing, analyze the enclosure atmosphere for hydrocarbon and methanol content, also record temperature and pressure. These measurements are the final readings for the enclosure calibration as well as the initial readings for the retention check.

(7) To verify the enclosure calibration, calculate the mass of propane and the mass of methanol using the measurements taken in steps (4) and (6). See paragraph (d) of this section.

This quantity must be within ±2 percent of that measured in step 5 above.

(8) Allow the enclosure to remain sealed for a minimum of 4 hours, analyze the enclosure atmosphere for hydrocarbon and methanol content; record temperature and barometric pressure. These are the final readings for the hydrocarbon and methanol retention check.

(9) Calculate, using the equations in paragraph (d) of this section and the readings taken in step (8), the hydrocarbon and methanol mass. It may not differ by more than 4 percent of the value in step (6).

(d) *Calculations.* (1) The calculation of net methanol and hydrocarbon mass change is used to determine enclosure background and leak rate. It is also used to check the enclosure volume measurements. The methanol mass change is calculated from the initial and final methanol samples, temperature and pressure according to the following equation:

$$M_{CH_3OH} = \left(\frac{V \times C_{MR}}{A_{MR}}\right) \times \left[\left(\frac{T_{Ef}}{V_{Ef} \times T_{SHEDf}}\right)\left((A_{MS1f} \times AV_{1f}) + (A_{MS2f} \times AV_{2f})\right) - \left(\frac{T_{Ei}}{V_{Ei} \times T_{SHEDi}}\right)\left((A_{MS1i} \times AV_{1i}) + (A_{MS2i} \times AV_{2i})\right)\right.$$

Where:

(i) M_{CH3OH}=Methanol mass change, µg.

(ii) V=Enclosure volume, ft³, as measured in paragraph (b)(1) of this section.

(iii) C_{MR}=Concentration of methanol in standard sample for calibration of GC, µg/ml.

(iv) A_{MR}=GC peak area of standard sample.

(v) T_E=Temperature of sample withdrawn, °R.

(vi) T_{SHED}=Temperature of SHED, °R.

(vii) V_E=Volume of sample withdrawn, ft³.

(viii) P_B=Barometric pressure at time of sampling, in. Hg.

(ix) A_{MS}=GC peak area of test sample

(x) AV=Volume of absorbing reagent in impinger (ml).

(xi) i=Initial sample.

(xii) f=Final sample.

(xiii) 1=First impinger

(xiv) 2=Second impinger.

(2) The hydrocarbon mass change is calculated from the initial and final FID readings of hydrocarbon concentration, methanol concentration with FID response to methanol, temperature, and pressure according to the following equation:

$$M_{HC} = kV \times 10^{-4} \left(\frac{(C_{HCf} - rC_{CH3OHf}) \times P_{Bf}}{T_f} \right) - \left(\frac{(C_{HCi} - rC_{CH3OHi}) \times P_{Bi}}{T_i} \right)$$

Where:

(i) M_{HC}=Hydrocarbon mass change, g.

(ii) C_{HC}=FID hydrocarbon concentration as ppm carbon including FID response to methanol in the sample.

(iii) C_{CH3OH}=Methanol concentration as ppm carbon

$$= \left(\frac{1.501 \times 10^{-3} C_{MR} \times T_E}{A_{MR} \times P_B \times V_E} \right) [(A_{S1} \times AV_1) + (A_{S2} \times AV_2)]$$

(iv) V=Enclosure volume ft^3 (m^3), as measured in paragraph (b)(1) of this section.

(v) r=FID response factor to methanol.

(vi) P_B=Barometric pressure, in. Hg. (kPa).

(vii) T=Enclosure ambient temperature, °R(°K).

(viii) i=Indicates initial reading.

(ix) f=Indicates final reading.

(x)(A) k=3.05.

(B) *For SI units,* k=17.60.

NOTE: Hydrocarbon concentration is stated in ppm carbon, that is, ppm propane × 3. Expressions in parentheses are for SI units.

[54 FR 14516, Apr. 11, 1989]

§ 86.118-78 Dynamometer calibration.

(a) The dynamometer shall be calibrated at least once each month or performance verified at least once each week and then calibrated as required. The calibration shall consist of the manufacturer's recommended calibration procedure plus a determination of the dynamometer frictional power absorption at 50.0 mph (80.5 km/h). One method for determining dynamometer frictional power absorption at 50.0 mph (80.5 km/h) is described below, other methods may be used if shown to yield equivalent results. The measured absorbed road power includes the dynamometer friction as well as the power absorbed by the power absorption unit. The dynamometer is driven above the test speed range. The device used to drive the dynamometer is then disengaged from the dynamometer and the roll(s) is (are) allowed to coast down. The kinetic energy of the system is dissipated by the dynamometer. This method neglects the variations in roll bearing friction due to the drive axle weight of the vehicle. The inertia of the free (rear) roll may be neglected in the case of dynamometers with paired rolls.

(1) Devise a method to determine the speed of the drive roll if it is not already measured. A fifth wheel, revolution pickup, or other suitable means may be used.

(2) Place a vehicle on the dynamometer or devise another method of driving the dynamometer.

(3) Engage the inertial flywheel or other inertial simulation system for the most common vehicle mass category for which the dynamometer is used. In addition other vehicle mass categories may be calibrated, if desired.

(4) Drive the dynamometer up to 50.0 mph (80.5 km/h).

(5) Record indicated road power.

(6) Drive the dynamometer up to 60.0 mph (96.9 km/h).

(7) Disengage the device used to drive the dynamometer.

(8) Record the time for the dynamometer drive roll to coastdown from 55.0 mph (88.5 km/h) to 45 mph (72.4 km/h).

(9) Adjust the power absorption unit to a different level.

(10) Repeat steps (4) to (9) above sufficient times to cover the range of road power used.

(11) Calculate absorbed road power (HP_d). See paragraph (c) of this section.

(12) Plot indicated road load power at 50 mph (80.5 km/h) versus road load power at 50 mph (80.5 km/h) as shown in Figure B78-5.

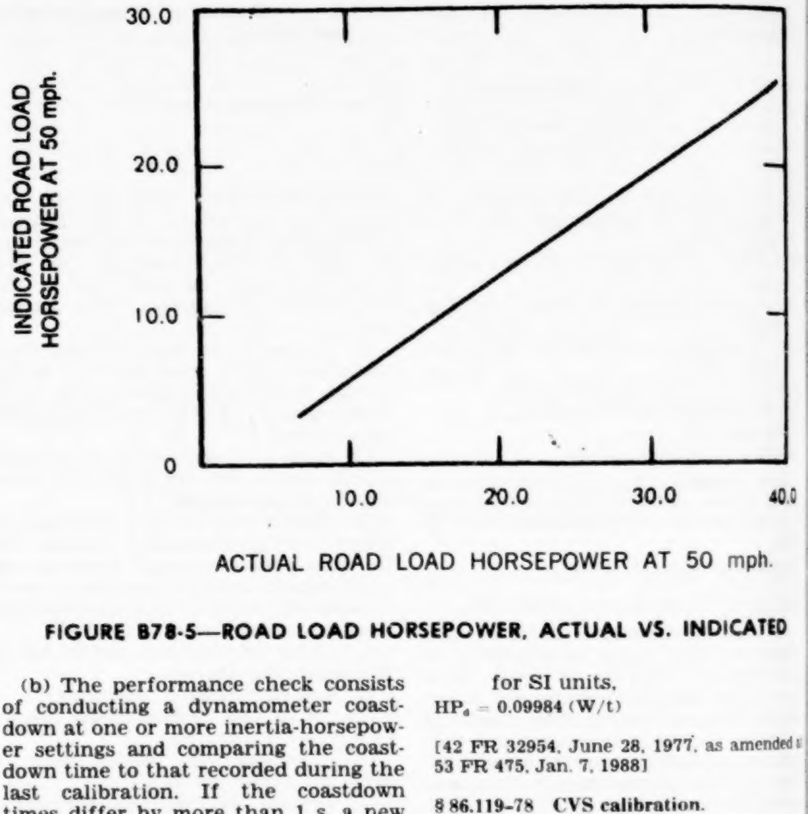


FIGURE B78-5—ROAD LOAD HORSEPOWER, ACTUAL VS. INDICATED

(b) The performance check consists of conducting a dynamometer coastdown at one or more inertia-horsepower settings and comparing the coastdown time to that recorded during the last calibration. If the coastdown times differ by more than 1 s, a new calibration is required.

(c) *Calculations.* The road load power actually absorbed by the dynamometer is calculated from the following equation:

$HP_d = (1/2)(W/32.2)(V_1^2 - V_2^2)/(550t)$

where:

HP_d = Power, horsepower (kilowatts)
W = Equivalent inertia, lb (kg)
V_1 = Initial Velocity, ft/s (m/s) (55 mph = 88.5 km/h = 80.67 ft/s = 24.58 m/s)
V_2 = Final Velocity, ft/s (m/s) (45 mph = 72.4 km/h = 66 ft/s = 20.11 m/s)
t = elapsed time for rolls to coast from 55 mph to 45 mph (88.5 to 72.4 km/h)

(Expressions in parenthesis are for SI units.) When the coastdown is from 55 to 45 mph (88.5 to 72.4 km/h) the above equation reduces to:

$HP_d = 0.06073 (W/t)$

for SI units,

$HP_d = 0.09984 (W/t)$

[42 FR 32954, June 28, 1977, as amended a 53 FR 475, Jan. 7, 1988]

§ 86.119-78 CVS calibration.

The CVS is calibrated using an accurate flowmeter and restrictor valve. Measurements of various parameters are made and related to flow through the unit. Procedures used by EPA for both PDP and CFV are outlined below. Other procedures yielding equivalent results may be used if approved in advance by the Administrator. After the calibration curve has been obtained, verification of the entire system can be performed by injecting a known mass of gas into the system and comparing the mass indicated by the system to the true mass injected. An indicated error does not necessarily mean that the calibration is wrong, since other factors can influence the accuracy of the system, e.g. analyzer calibration. A verification procedure is found in paragraph (c) of this section.

(a) *PDP calibration.* (1) The following calibration procedure outlines the equipment, the test configuration, and the various parameters which must be measured to establish the flow rate of the CVS pump. All the parameters related to the pump are simultaneously measured with the parameters related to a flowmeter which is connected in series with the pump. The calculated flow rate ft^3/min. (at pump inlet absolute pressure and temperature) can then be plotted versus a correlation function which is the value on a specific combination of pump parameters. The linear equation which relates the pump flow and the correlation function is then determined. In the event that a CVS has a multiple speed drive, a calibration for each range used must be performed.

(2) This calibration procedure is based on the measurement of the absolute values of the pump and flowmeter parameters that relate the flow rate at each point. Three conditions must be maintained to assure the accuracy and integrity of the calibration curve. First, the pump pressures should be measured at taps on the pump rather than at the external piping on the pump inlet and outlet. Pressure taps that are mounted at the top center and bottom center of the pump drive headplate are exposed to the actual pump cavity pressures, and therefore reflect the absolute pressure differentials. Secondly, temperature stability must be maintained during the calibration. The laminar flowmeter is sensitive to inlet temperature oscillations which cause the data points to be scattered. Gradual changes (±2° F (1.1° C)) in temperature are acceptable as long as they occur over a period of several minutes. Finally, all connections between the flowmeter and the CVS pump must be absolutely void of any leakage.

(3) During an exhaust emission test the measurement of these same pump parameters enables the user to calculate the flow rate from the calibration equation.

(4) Connect a system as shown in Figure B78-6. Although particular types of equipment are shown, other configurations that yield equivalent results may be used if approved in advance by the Administrator. For the system indicated, the following data with given accuracy are required:

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Tolerances
Barometric pressure (corrected)	P_B	Inches Hg (kPa)	±.01 in Hg (±.034 kPa).
Ambient temperature	T_A	° F (° C)	±.5° F (±.28° C).
Air temperature into LFE	ETI	° F (° C)	±.25° F (±.14° C).
Pressure depression upstream of LFE	EPI	Inches H_2O (kPa)	±.05 in H_2O (±.012 kPa).
Pressure drop across the LFE matrix	EDP	Inches H_2O (kPa)	±.005 in H_2O (±.001 kPa).
Air temperature at CVS pump inlet	PTI	° F (° C)	±.5° F (±.28° C).
Pressure depression at CVS pump inlet	PPI	Inches fluid (kPa)	±.05 in fluid (±.022 kPa).
Specific gravity of manometer fluid (1.75 oil)	Sp. Gr.		
Pressure head at CVS pump outlet	PPO	Inches fluid (kPa)	±.05 in fluid (±.022 kPa).
Air temperature at CVS pump outlet (optional)	PTO	° F (° C)	±.5° F (±.28° C).
Pump revolutions during test period	N	Revs	±1 Rev.
Elapsed time for test period	t	s	±.05 s.

(5) After the system has been connected as shown in Figure B78-6, set the variable restrictor in the wide open position and run the CVS pump for 20 minutes. Record the calibration data.

(6) Reset the restrictor valve to a more restricted condition in an increment of pump inlet depression (about 4″ H_2O(1.0 kPa) that will yield a minimum of six data points for the total calibration. Allow the system to stabilize for 3 minutes and repeat the data acquisition.

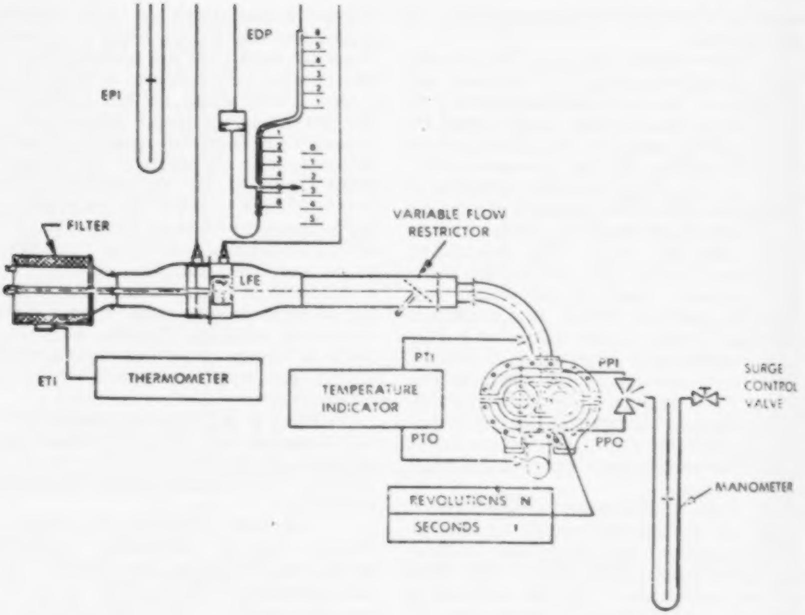

EPI
EDP
FILTER
LFE
VARIABLE FLOW RESTRICTOR
ETI
THERMOMETER
PTI
TEMPERATURE INDICATOR
PTO
PPI
PPO
SURGE CONTROL VALVE
REVOLUTIONS N
SECONDS t
MANOMETER

FIGURE B78-6—PDP-CVS CALIBRATION CONFIGURATION

(7) Data analysis:

(i) The air flow rate, Qs, at each test point is calculated in standard cubic feet per minute from the flowmeter data using the manufacturer's prescribed method.

(ii) The air flow rate is then converted to pump flow, V_o, in cubic feet per revolution at absolute pump inlet temperature and pressure.

$$V_o = Qs/n \times T_p/528 \times 29.92/P_p$$

where:

V_o = Pump flow, ft^3/revolution (m^3/revolution) at T_p, P_p

Qs = Meter air flow rate in standard cubic feet per minute, standard conditions are 68° F, 29.92 in. Hg (20° C, 101.3 kPa).

n = Pump speed in revolutions per minute.

T_p = Pump inlet temperature, R(K) = PTI + 460

for SI units, T_p = PTI + 273

P_p = Absolute pump inlet pressure, in. Hg (kPa) = P_B − PPI (SP. GR./13.57)

for SI units, $P_p = P_B$ − PPI

Where:

P_B = barometric pressure, in. Hg (kPa)

PPI = Pump inlet depression, in. fluid (kPa)

SP. GR. = Specific gravity of manometer fluid relative to water.

(iii) The correlation function at each test point is then calculated from the calibration data:

$$X_o = \frac{1}{n} \sqrt{\frac{\Delta P_p}{P_e}}$$

where:

X_o = correlation function.

P_p = The pressure differential from pump inlet to pump outlet, in. Hg (kPa) = $P_e - P_p$

P_e = Absolute pump outlet pressure, in. Hg (kPa) = P_B + PPO (SP. GR./13.57)

for SI units, $P_e = P_B$ + PPO

where:

PPO = Pressure head at pump outlet, in. fluid (kPa)

(iv) A linear least squares fit is performed to generate the calibration equations which have the forms:

$$V_o = D_o - M(X_o)$$
$$n = A - B(P_p)$$

D_o, M, A, and B are the slope-intercept constants describing the lines.

(8) A CVS system that has multiple speeds should be calibrated on each speed used. The calibration curves generated for the ranges will be approximately parallel and the intercept values, D_o, will increase as the pump flow range decreases.

(9) If the calibration has been performed carefully, the calculated values from the equation will be within ±0.50 percent of the measured value of V_o. Values of M will vary from one pump to another, but values of D_o for pumps of the same make, model, and range should agree within ±3 percent of each other. Particulate influx from use will cause the pump slip to decrease as reflected by lower values for M. Calibrations should be performed at pump start-up and after major maintenance to assure the stability of the pump slip rate. Analysis of mass injection data will also reflect pump slip stability.

(b) *CFV calibration.* (1) Calibration of the CFV is based upon the flow equation for a critical venturi. Gas flow is a function of inlet pressure and temperature:

$$Q_s = \frac{K_v P}{\sqrt{T}}$$

where:

Q_s = Flow
K_v = Calibration coefficient
P = Absolute pressure
T = Absolute temperature

The calibration procedure described below establishes the value of the calibration coefficient at measured values of pressure, temperature and air flow.

(2) The manufacturer's recommended procedure shall be followed by calibrating electronic portions of the CFV.

(3) Measurements necessary for flow calibration are as follows:

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Tolerances
Barometric pressure (corrected)	PB	Inches Hg (kPa)	±.01in Hg (±.034 kPa).
Air temperature, flowmeter	ETI	°F (°C)	±.25°F (±.14°C).
Pressure depression upstream of LFE	EPI	Inches H_2O (kPa)	±.05 in H_2O (±.012 kPa).
Pressure drop across LFE matrix	EDP	Inches H_2O (kPa)	±.005 in H_2O (±.001 kPa).
Air flow	Q_s	Ft³/min. (m³/min.)	±.5 pct.
CFV inlet depression	PPI	Inches fluid (kPa)	±.05 in fluid (±.022 kPa).
Temperature at venturi inlet	T_v	°F (°C)	±.5°F (±.28°C).
Specific gravity of manometer fluid (1.75 oil)	Sp. Gr.		

(4) Set up equipment as shown in Figure B78-7 and check for leaks. Any leaks between the flow measuring device and the critical flow venturi will seriously affect the accuracy of the calibration.

(5) Set the variable flow restrictor to the open position, start the blower, and allow the system to stabilize. Record data from all instruments.

(6) Vary the flow restrictor and make at least 8 readings across the critical flow range of the venturi.

(7) Data analysis: The data recorded during the calibration are to be used in the following calculations:

(i) The air flow rate, Qs, at each test point is calculated in standard cubic feet per minute from the flow meter data using the manufacturer's prescribed method.

(ii) Calculate values of the calibration coefficient for each test point:

$$K_v = \frac{Q_s \sqrt{T_v}}{P_v}$$

where:

Q_s = Flow rate in standard cubic feet per minute, standard conditions are 68° F, 29.92 in. Hg (20° C, 101.3 kPa).
T_v = Temperature at venturi inlet, *R(K)*.

P_v = Pressure at venturi inlet, mm Hg (kPa) = $P_B - PPI$ (SP. GR./13.57).
for SI units $P_v = P_B - PPI$.

where:

PPI = Venturi inlet pressure depression, in. fluid (kPa).

SP. GR. = Specific gravity of manometer fluid, relative to water.

(iii) Plot K_v as a function of venturi inlet pressure. For sonic flow K_v will have a relatively constant value. As pressure decreases (vacuum increases) the venturi becomes unchoked and K_v decreases. See Figure B78-8.

(iv) For a minimum of 8 points in the critical region calculate an average K_v and the standard deviation.

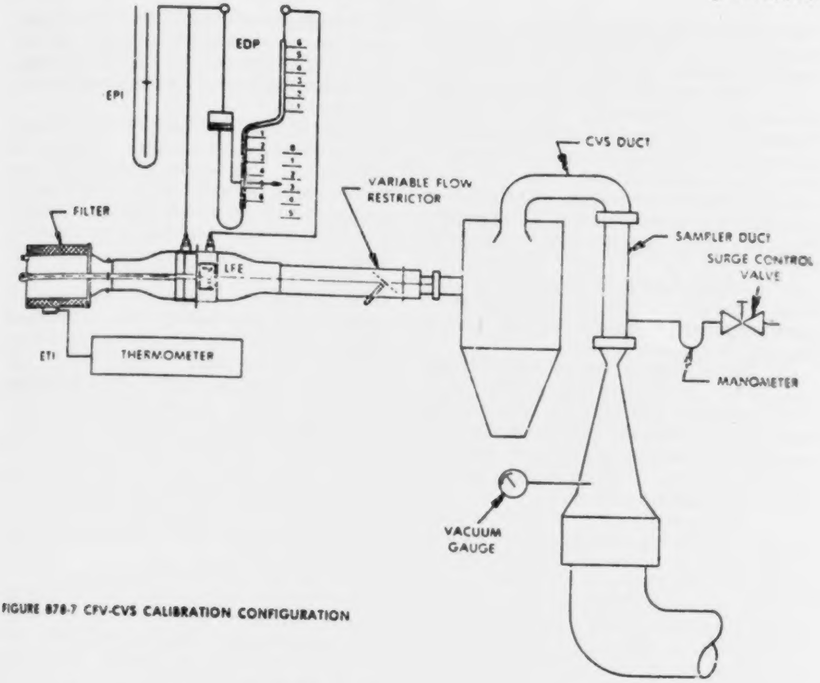

EPI
EDP
FILTER
LFE
ETI
THERMOMETER
VARIABLE FLOW RESTRICTOR
CVS DUCT
SAMPLER DUCT
SURGE CONTROL VALVE
MANOMETER
VACUUM GAUGE

FIGURE B78-7 CFV-CVS CALIBRATION CONFIGURATION

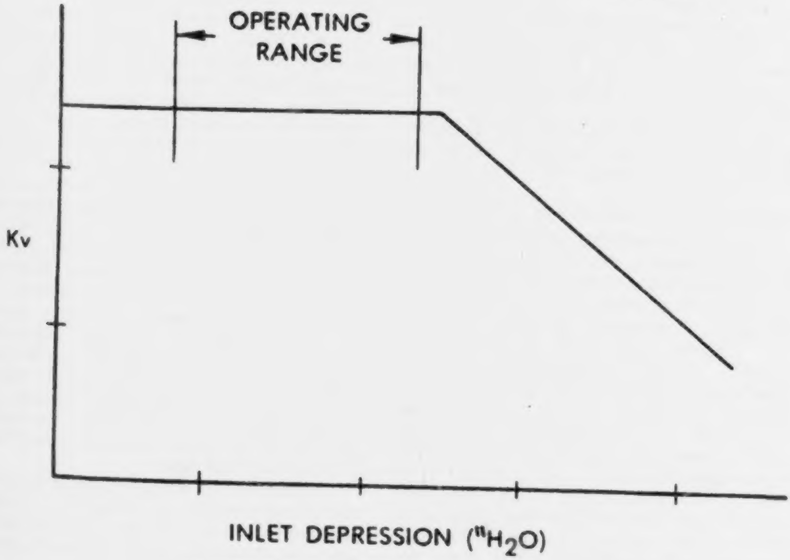


FIGURE B78-8—SONIC FLOW CHOKING

(v) If the standard deviation exceeds 0.3 percent of the average K_v take corrective action.

(c) *CVS System Verification*. The following "gravimetric" technique can be used to verify that the CVS and analytical instruments can accurately measure a mass of gas that has been injected into the system. (Verification can also be accomplished by constant flow metering using critical flow orifice devices.)

(1) Obtain a small cylinder that has been charged with pure propane or carbon monoxide gas (caution—carbon monoxide is poisonous).

(2) Determine a reference cylinder weight to the nearest 0.01 grams.

(3) Operate the CVS in the normal manner and release a quantity of pure propane or carbon monoxide into the system during the sampling period (approximately 5 minutes).

(4) The calculations of § 86.144 are performed in the normal way except, in the case of propane. The density of propane (17.30 g/ft^3/carbon atom (0.6109 kg/m^3/carbon atom)) is used in place of the density of exhaust hydrocarbons. In the case of carbon monoxide, the density of 32.97 g/ft^3 (1.164 kg/m^3) is used.

(5) The gravimetric mass is subtracted from the CVS measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

(6) The cause for any discrepancy greater than ±2 percent must be found and corrected.

§ 86.119-90 CVS calibration.

The CVS is calibrated using an accurate flowmeter and restrictor valve. Measurements of various parameters are made and related to flow through the unit. Procedures used by EPA for both PDP and CFV are outlined below. Other procedures yielding equivalent results may be used if approved in advance by the Administrator. After the calibration curve has been obtained, verification of the entire system can be performed by injecting a known mass of gas into the system and comparing the mass indicated by the system to the true mass injected. An indicated error does not necessarily mean that the calibration is wrong, since other factors can influence the accuracy of the system, *e.g.*, analyzer calibration. A verification procedure is found in paragraph (c) of this section.

(a) *PDP calibrations*. (1) The following calibration procedure outlines the equipment, the test configuration, and the various parameters which must be measured to establish the flow rate of the CVS pump. All the parameters related to the pump are simultaneously measured with the parameters related to a flowmeter which is connected in series with the pump. The calculated flow rate ft^3/min (at pump inlet absolute pressure and temperature) can then be plotted versus a correlation function which is the value on a specific combination of pump parameters. The linear equation which relates the pump flow and the correlation function is then determined. In the event that a CVS has a multiple speed drive, a calibration for each range used must be performed.

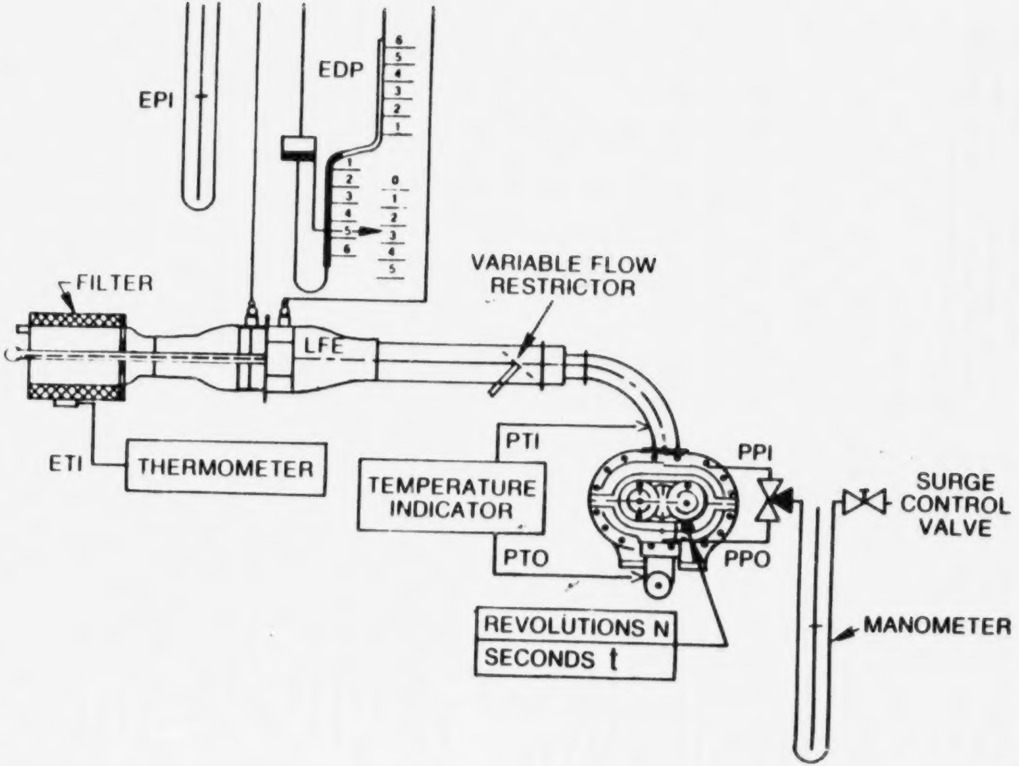
(2) This calibration procedure is based on the measurement of the absolute values of the pump and flowmeter parameters that relate the flow rate at each point. Three conditions must be maintained to assure the accuracy and integrity of the calibration curve. First, the pump pressures should be measured at taps on the pump rather than at the external piping on the pump inlet and outlet. Pressure taps that are mounted at the top center and bottom center of the pump drive headplate are exposed to the actual pump cavity pressures, and therefore reflect the absolute pressure differentials. Secondly, temperature stability must be maintained during the calibration. The laminar flowmeter is sensitive to inlet temperature oscillations which cause the data points to be scattered. Gradual changes (±2°F (1.1°C)) in temperature are acceptable as long as they occur over a period of several minutes. Finally, all connections between the flowmeter and the CVS pump must be absolutely void of any leakage.

(3) During an exhaust emission test the measurement of these same pump parameters enables the user to calculate the flow rate from the calibration equation.

(4) Connect a system as shown in Figure B90–8. Although particular types of equipment are shown, other configurations that yield equivalent results may be used if approved in advance by the Administrator. For the system indicated, the following data with given accuracy are required:

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Tolerances
Barometric pressure (corrected)	P_B	in. Hg (kPa)	±0.01 in. Hg (±0.034 kPa)
Ambient temperature	T_A	°F(°C)	±0.5°F (±0.28°C)
Air temperature into LFE	ETI	°F(°C)	±0.25°F (±0.14°C)
Pressure depression upstream of LFE	EPI	in. H_2O (kPa)	±0.05 in. H_{20} (±0.012 kPa)
Pressure drop across the LFE matrix	EDP	in. H_2O (kPa)	±0.005 in. H_2O (±0.001 kPa)
Air temperature at CVS pump inlet	PTI	°F(°C)	±0.5°F (±0.3°C)
Pressure depression at CVS pump inlet	PPI	in. fluid (kPa)	±0.05 in. fluid (±0.022 kPa)
Specific gravity of manometer fluid (1.75 oil)	Sp. Gr.		
Pressure head at CVS pump outlet	PPO	in. fluid (kPa)	±0.05 in. fluid (±0.022 kPa)
Air temperature at CVS pump outlet (optional)	PTO	°F(°C)	±0.5°F (±0.28°C)
Pump revolutions during test period	N	Revs	±1 Rev.
Elapsed time for test period	t	sec	±0.05 sec.


EPI
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FILTER
LFE
VARIABLE FLOW RESTRICTOR
ETI
THERMOMETER
PTI
TEMPERATURE INDICATOR
PTO
PPI
PPO
SURGE CONTROL VALVE
MANOMETER
REVOLUTIONS N
SECONDS t

FIGURE B90-8 PDP-CVS CALIBRATION CONFIGURATION

(5) After the system has been connected as shown in Figure B90–8, set the variable restrictor in the wide open position and run the CVS pump for 20 minutes. Record the calibration data.

(6) Reset the restrictor valve to a more restricted condition in an increment of pump inlet depression (about 4 in. H_2O (1.0 kPa) that will yield a minimum of six data points for the total calibration. Allow the system to stabilize for 3 minutes and repeat the data acquisition.

(7) Data analysis:

(i) The air flow rate, Q_s, at each test point is calculated in standard cubic feet per minute from the flowmeter data using the manufacturer's prescribed method.

(ii) The air flow rate is then converted to pump flow, V_o, in cubic feet per revolution at absolute pump inlet temperature and pressure:

$$V_o=(Q_s/n)\times(T_p/528)\times(29.92/P_p)$$

Where:

(A) V_o=Pump flow ft³/rev (m³/rev) at T_p, P_p.

(B) Q_s=Meter air flow rate in standard cubic feet per minute, standard conditions are 68 °F, 29.92 in. Hg (20 °C, 101.3 kPa).

(C) n=Pump speed in revolutions per minute.

(D)(*1*) T_p=Pump inlet temperature, °R(°K)=PTI+460.

(*2*) *For SI units*, T_p=PTI+273.

(E)(*1*) P_p=Absolute pump inlet pressure, in. Hg. (kPa) =P_B−PPI (SP.GR./13.57).

(*2*) *For SI units*, P_p=P_B−PPI.

Where:

(F) P_B=barometric pressure, in. Hg. (kPa).

(G) PPI = Pump inlet depression, in. fluid (kPa).

(H) SP.GR.=Specific gravity of manometer fluid relative to water.

(iii) The correlation function at each test point is then calculated from the calibration data:

$$X_o = \frac{1}{n}\sqrt{\frac{\Delta P_p}{P_e}}$$

Where:

(A) X_o=correlation function.

(B) ΔP_p=the pressure differential from pump inlet to pump outlet, in. Hg (kPa)=P_e−P_p.

(C)(*1*) P_e=Absolute pump outlet pressure, in Hg, (kPa)=$_{PB}$+PPO (SP.GR./13.57).

(*2*) *For SI units*, P_e=P_B+PPO.

Where:

(D) PPO=Pressure head at pump outlet, in. fluid (kPa).

(iv) A linear least squares fit is performed to generate the calibration equations which have the forms:

$$V_o=D_o-M(X_o)$$
$$n=A-B(\Delta P_p)$$

D_o, M, A, and B are the slope-intercept constants describing lines.

(8) A CVS system that has multiple speeds should be calibrated on each speed used. The calibration curves generated for the ranges will be approximately parallel and the intercept values, D_o, will increase as the pump flow range decreases.

(9) If the calibration has been performed carefully, the calculated values from the equation will be within ±0.50 percent of the measured value of V_o. Values of M will vary from one pump to another, but values of D_o for pumps of the same make, model, and range should agree within ±3 percent of each other. Particulate influx from use will cause the pump slip to decrease as reflected by lower values for M. Calibrations should be performed at pump start-up and after major maintenance to assure the stability of the pump slip rate. Analysis of mass injection data will also reflect pump slip stability.

(b) *CFV calibration*. (1) Calibration of the CFV is based upon the flow equation for a critical venturi. Gas flow is a function of inlet pressure and temperature:

$$Q_s = \frac{K_v P}{\sqrt{T}}$$

Where:

(i) Q_s=Flow.
(ii) K_v=Calibration coefficient.
(iii) P=Absolute pressure.
(iv) T=Absolute temperature.

The calibration procedure described below establishes the value of the calibration coefficient at measured values of pressure, temperature and air flow.

(2) The manufacturer's recommended procedure shall be followed for calibrating electronic portions of the CFV.

(3) Measurements necessary for flow calibration are as follows:

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Tolerances
Barometric pressure (corrected)	P_B	in. Hg (kPa)	±0.01 in. Hg (±0.034 kPa).
Air temperature, into flowmeter	ETI	°F(°C)	±0.25 °F(+0.14 °C).
Pressure depression upstream of LFE	EPI	in. H_2O (kPa)	±0.05 in. H_2O (±0.012 kPa).
Pressure drop across LFE matrix	EDP	in. H_2O (kPa)	±0.005 in. H_2O (±0.001 kPa
Air flow	Q_s	ft³/min (m³/min)	±0.5%.
CFV inlet depression	PPI	in. fluid (kPa)	±0.05 in. fluid (±0.022 kPa).
Temperature at venturi inlet	T_v	°F(°C)	±0.5 °F (±0.28 °C.
Specific gravity of manometer fluid (1.75 oil)	Sp. Gr.		

(4) Set up equipment as shown in Figure B90-9 and check for leaks. Any leaks between the flow measuring device and the critical flow venturi will seriously affect the accuracy of the calibration.

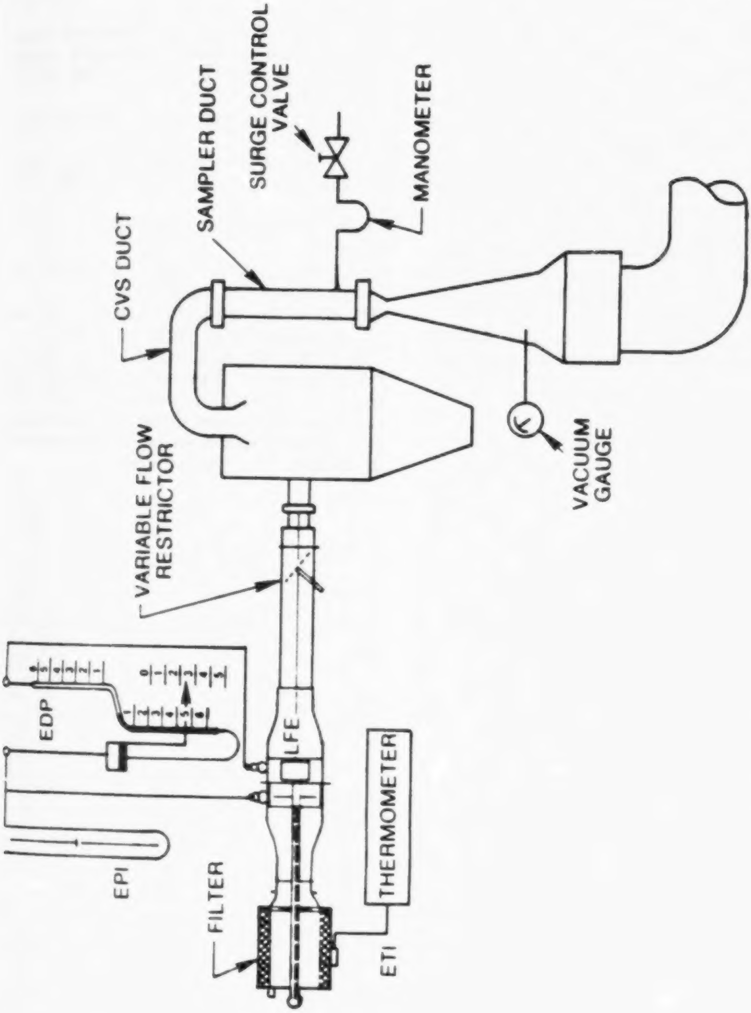
CVS DUCT
SAMPLER DUCT
SURGE CONTROL VALVE
MANOMETER
VARIABLE FLOW RESTRICTOR
VACUUM GAUGE
EDP
EPI
LFE
THERMOMETER
FILTER
ETI

FIGURE B90-9 CFV-CVS CALIBRATION CONFIGURATION

(5) Set the variable flow restrictor to the open position, start the blower, and allow the system to stabilize. Record data from all instruments.

(6) Vary the flow restrictor and make at least 8 readings across the critical flow range of the venturi.

(7) *Data analysis:* The data recorded during the calibration are to be used in the following calculations:

(i) The air flow rate, Q_s, at each test point is calculated in standard cubic feet per minute from the flow meter data using the manufacturer's prescribed method.

(ii) Calculate values of the calibration coefficient for each test point:

$$K_v = \frac{Q_s\sqrt{T_v}}{P_v}$$

Where:

(A) Q_s=Flow rate in standard cubic feet per minute, standard conditions are 68 °F 29.92 in. Hg (20 °C, 101.3 kPa).

(B) T_v=Temperature at venturi inlet, °R(°K).

(C)(*1*) P_v=Pressure at venturi inlet, mm Hg (kPa)= P_B−PPI (SP.GR./13.57).

(*2*) *For SI units*, $P_v = P_B - \text{PPI}$.

Where:

(D) PPI=Venturi inlet pressure depression, in. fluid (kPa).

(E) SP.GR.=Specific gravity of manometer fluid, relative to water.

(iii) Plot K_v as a function of venturi inlet pressure. For sonic flow K_v will have a relatively constant value. As pressure decreases (vacuum increases), the venturi becomes unchoked and K_v decreases. See Figure B90-10.

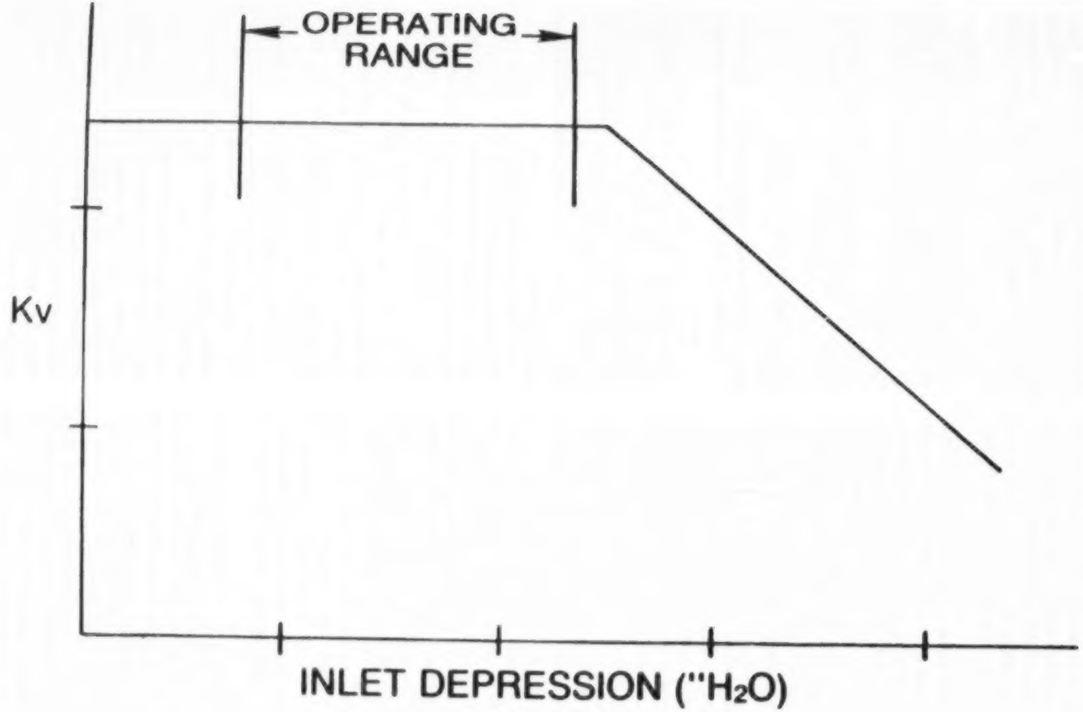

FIGURE B90-10 SONIC FLOW CHOKING

(iv) For a minimum of 8 points in the critical region calculate an average K_v and the standard deviation.

(v) If the standard deviation exceeds 0.3 percent of the average K_v take corrective action.

(c) *CVS System Verification.* The following "gravimetric" technique can be used to verify that the CVS and analytical instruments can accurately measure a mass of gas that has been injected into the system. If the CVS and analytical system will be used only in the testing of petroleum-fueled engines, the system verification may be performed using either propane or carbon monoxide. If the CVS and analytical system will be used with methanol-fueled vehicles as well as petroleum-fueled vehicles, system verification performance check must include a methanol check in addition to either the propane or carbon monoxide check. (Verification can also be accomplished by constant flow metering using critical flow orifice devices.)

(1) Obtain a small cylinder that has been charged with pure propane or carbon monoxide gas (CAUTION—carbon monoxide is poisonous). Obtain another small cylinder which has been charged with pure methanol if the system will be used for methanol-fueled vehicle testing. Since this cylinder will be heated to 150-155°F, care must be taken to ensure that the liquid volume of methanol placed in the cylinder does not exceed approximately one-half of the total volume of the cylinder.

(2) Determine a reference cylinder weight to the nearest 0.01 grams.

(3) Operate the CVS in the normal manner and release a quantity of pure propane or carbon monoxide into the system during the sampling period (approximately 5 minutes).

(4) Following the completion of step (3) above, continue to operate the CVS in the normal manner and release a quantity of pure methanol into the system during the sampling period (approximately 5 minutes).

(5) The calculations of § 86.144 are performed in the normal way, except in the case of propane. The density of propane (17.30 g/ft^3/carbon atom (0.6109 kg/m^3/carbon atom)) is used in place of the density of exhaust hydrocarbons. In the case of carbon monoxide, the density of 32.97 g/ft^3 (1.164 kg/m^3) is used. In the case of methanol, the density of 37.71 g/ft^3 (1.332 kg/m^3) is used.

(6) The gravimetric mass is subtracted from the CVS measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

(7) The cause for any discrepancy greater than ±2 percent must be found and corrected.

[54 FR 14518, Apr. 11, 1989]

§ 86.120-82 Gas meter or flow instrumentation calibration, particulate measurement.

Sampling for particulate emissions requires the use of gas meters or flow instrumentation to measure flow through the particulate filters. The meters or instrumentation shall receive initial and periodic calibrations as follows:

(a) Install a standard air flow measurement device upstream of the gas meter or instrument being calibrated. This standard device shall measure air flow at standard conditions with an accuracy of ±1 percent. Standard conditions are defined as 68°F (20°C) and 29.92 in. Hg (101.3 kPa). A critical flow orifice, a bellmouth, or a laminar flow element is recommended as the standard device.

(b) Flow air through the calibration system at the sample flow rate used for particulate testing and at the backpressure which occurs during the sample test.

(c) When the temperature and pressure in the system have stabilized, measure the gas meter or instrument indicated volume over a time period of at least 5 minutes and until a flow volume of at least ±1 percent accuracy can be determined by the standard device. Record the stabilized air temperature and pressure upstream of the gas meter or instrument being calibrated and as required for the standard device.

(d) Calculate air flow at standard conditions as measured by both the standard device and the gas meter or instrument being calibrated.

(e) Repeat the procedures of paragraphs (b) through (d) of this section using flow rates which are 10 percent above the nominal sampling flow rate and 10 percent below the nominal sampling flow rate.

(f) If the air flow at standard conditions measured by the gas meter or instrument being calibrated differs by more than ±1 percent from the standard measurement at any of the three measured flow rates, then a correction shall be made by either of the following two methods:

(1) Mechanically adjust the gas meter or instrument so that it agrees within 1 percent of the standard measurement at the three specified flow rates, or

(2) Develop a continuous best fit calibration curve for the gas meter (as a function of the standard device flow measurement) from the three calibration points that represents the data to within 1 percent at all points to determine corrected flow.

(g) *Other systems.* A bell prover may be used to calibrate the gas meter if the procedure outlined in ANSI B109.1-1973 is used. Prior approval by the Administrator is not required to use the bell prover.

[45 FR 14515, Mar. 5, 1980]

§ 86.121-82 Hydrocarbon analyzer calibration.

The hydrocarbon analyzers shall receive the following initial and periodic calibration. The HFID shall be operated at a temperature of 375±10 °F (191±6 °C).

(a) *Initial and periodic optimization of FID and HFID response.* Prior to its introduction into service and at least annually thereafter, the FID and HFID hydrocarbon analyzers shall be adjusted for optimum hydrocarbon response. Alternate methods yielding equivalent results may be used, if approved in advance by the Administrator.

(1) Follow the manufacturer's instructions or good engineering practice for instrument startup and basic operating adjustment using the appropriate fuel and zero-grade air.

(2) Optimize on the most common operating range. Introduce into the analyzer a propane in air mixture with a propane concentration equal to approximately 90 percent of the most common operating range.

(3) One of the following is required for FID or HFID optimization:

(i) For all FIDs and HFIDs, the procedures specified by the applicable FID or HFID manufacturer.

(ii) For Beckman 400 FIDs only, implementation of the recommendations outlined in Society of Automotive Engineers (SAE) paper No. 770141, "Optimization of Flame Ionization Detector for Determination of Hydrocarbons in Diluted Automobile Exhaust;" author, Glenn D. Reschke.

(iii) For HFIDs only, the following peaking procedure. (A) With the fuel and air flow rates set at the manufacturer's recommendations, determine the analyzer response from the difference between the span-gas response and the zero gas response. Incrementally adjust the fuel flow above and below the manufacturer's specification. Record the span and zero response at these fuel flows. A plot of the difference between the span and zero response versus the fuel flow will be similar to the one shown in Fig. B87-11. Adjust the fuel-flow rate to the highest setting that produces the maximum analyzer response.

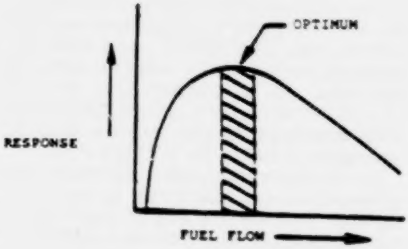

FIGURE B87-11 RESPONSE VS. FUEL FLOW

(B) To determine the optimum air flow, use the fuel flow setting determined in paragraph (a)(3)(iii)(A) of this section and vary air flow.

(iv) Alternative procedures may be used if approved in advance by the Administrator.

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(4) After the optimum flow rates have been determined, record them for future reference.

(b) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter the FID or HFID hydrocarbon analyzers shall be calibrated on all normally used instrument ranges. Use the same flow rate as when analyzing samples.

(1) Adjust analyzer to optimize performance.

(2) Zero the hydrocarbon analyzer with zero-grade air.

(3) Calibrate on each normally used operating range with propane in air calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. For each range calibrated, if the deviation from a least squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

[45 FR 14516, Mar. 5, 1980, as amended at 54 FR 2122, Jan. 19, 1989]

§ 86.121–90 Hydrocarbon analyzer calibration.

The hydrocarbon analyzers shall receive the following initial and periodic calibration. The HFID used with petroleum-fueled diesel vehicles shall be operated at a temperature of 375 °F±10 °F (191 °±6 °C). The HFID used with methanol-fueled vehicles shall be operated at 235 °±15 °F (113±8 °C).

(a) *Initial and periodic optimization of detector response.* Prior to its introduction into service and at least annually thereafter, the FID and HFID hydrocarbon analyzers shall be adjusted for optimum hydrocarbon response. Alternate methods yielding equivalent results may be used, if approved in advance by the Administrator.

(1) Follow the manufacturer's instructions or good engineering practice for instrument startup and basic operating adjustment using the appropriate FID fuel and zero-grade air.

(2) Optimize on the most common operating range. Introduce into the analyzer a propane in air mixture (methanol in air mixture for methanol-fueled vehicles when optional methanol calibrated HFID procedure is used during the 1990 through 1994 model year) with a propane (or methanol) concentration equal to approximately 90 percent of the most common operating range.

(3) One of the following is required for FID or HFID optimization:

(i) For all FIDs and HFIDs, the procedures specified by the applicable FID or HFID manufacturer.

(ii) For Beckman 400 FIDs only, implementation of the recommendations outlined in Society of Automotive Engineers (SAE) paper No. 770141, "Optimization of Flame Ionization Detector for Determination of Hydrocarbons in Diluted Automobile Exhaust"; author, Glenn D. Reschke.

(iii) For HFIDs only, the following peaking procedure. (A) With the fuel and air flow rates set in the manufacturer's recommendations, determine the analyzer response from the difference between the span-gas response and the zero gas response. Incrementally adjust the fuel flow above and below the manufacturer's specification. Record the span and zero response at these fuel flows. A plot of the difference between the span and zero response versus the fuel flow will be similar to the one shown in Fig. B87-11. Adjust the fuel-flow rate to the highest setting that produces the maximum analyzer response.

(B) To determine the optimum air flow, use the fuel flow setting determined in paragraph (a)(3)(iii)(A) of this section and vary air flow.

(iv) Alternative procedures may be used if approved in advance by the Administrator.

(4) To determine the optimum air flow, use the FID fuel flow setting determined above and vary air flow.

(5) After the optimum flow rates have been determined, record them for future reference.

(b) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter the FID or HFID hydrocarbon analyzers shall be calibrated on all normally used instrument ranges, and, if testing methanol vehicles under the procedure described in § 86.107-90(a)(2)(ii) or § 86.110-90(a)(4), the methanol response factor shall be determined (paragraph (c) of this section). Use the same flow rate as when analyzing sample.

(1) Adjust analyzer to optimize performance.

(2) Zero the hydrocarbon analyzer with zero-grade air.

(3) Calibrate on each normally used operating range with propane in air calibration gases (methanol in air as appropriate) having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. For each range calibrated, if the deviation from a least squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

(c) *FID response factor to methanol.* When the FID analyzer is to be used for the analysis of hydrocarbon samples containing methanol, the methanol response factor of the analyzer shall be established. The methanol response factor shall be determined at several concentrations in the range of concentrations in the exhaust sample.

(1) The bag sample of methanol for analysis in the FID shall be prepared using the apparatus shown in Figure B90-11. A known volume of methanol is injected, using a microliter syringe, into the heated mixing zone (250 °F(121 °C)) of the apparatus. The methanol is vaporized and swept into the sample bag with a known volume of zero grade air measured by a dry gas meter.

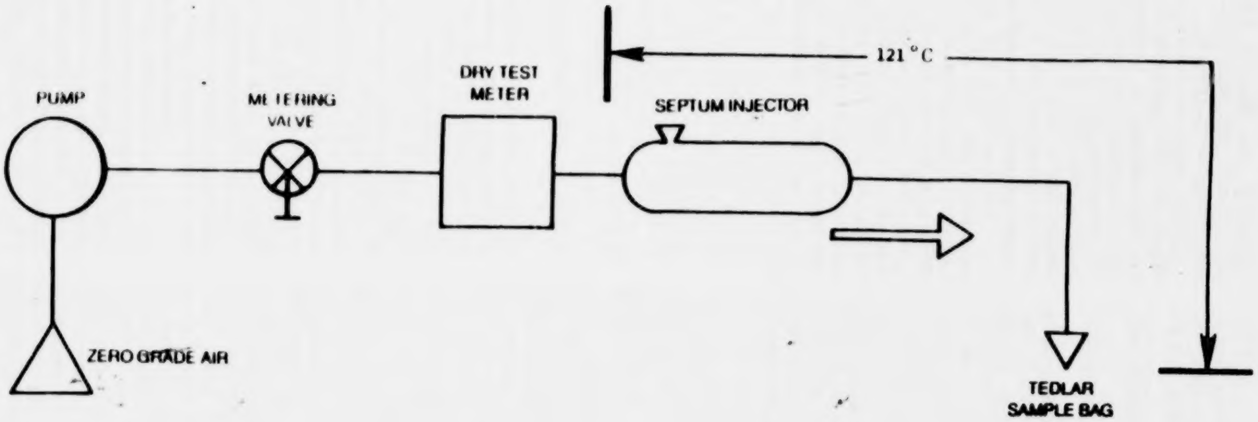

PUMP
METERING VALVE
DRY TEST METER
SEPTUM INJECTOR
121 °C
ZERO GRADE AIR
TEDLAR SAMPLE BAG

FIGURE B90-11 APPARATUS FOR PREPARATION OF FID METHANOL RESPONSE CALIBRATION MIX

(2) The bag sample is analyzed using the FID.

(3) The FID response factor, r, is calculated as follows:

r=FIDppm/SAMppm

Where:

(i) r=FID response factor.

(ii) FIDppm=FID reading in ppmC.

(iii) SAMppm=methanol concentration in the sample bag in ppmC

$$= \frac{0.02406 \times \text{Fuel injected} \times \text{Fuel density}}{\text{Air volume} \times \text{Mol. Wt. } CH_3OH}$$

Where:

(iv) 0.02406=Volume of one mole at 29.92 in. Hg and 68 °F, m^3.

(v) Fuel injected=Volume of methanol injected, ml.

(vi) Fuel density=Density of methanol, 0.7914 g/ml.

(vii) Air volume=Volume of zero grade air, m^3.

(viii) Mol. Wt. CH_3OH=32.04.

[54 FR 14525, Apr. 11, 1989]

§ 86.122-78 Carbon monoxide analyzer calibration.

The NDIR carbon monoxide analyzer shall receive the following initial and periodic calibrations:

(a) *Initial and periodic interference check.* Prior to its introduction into service and annually thereafter the NDIR carbon monoxide analyzer shall be checked for response to water vapor and CO_2:

(1) Follow the manufacturer's instructions for instrument startup and operation. Adjust the analyzer to optimize performance on the most sensitive range to be used.

(2) Zero the carbon monoxide analyzer with either zero-grade air or zero-grade nitrogen.

(3) Bubble a mixture of 3 percent CO_2 in N_2 through water at room temperature and record analyzer response.

(4) An analyzer response of more than 1 percent of full scale for ranges above 300 ppm full scale or of more than 3 ppm on ranges below 300 ppm full scale will require corrective action. (Use of conditioning columns is one form of corrective action which may be taken.)

(b) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter the NDIR carbon monoxide analyzer shall be calibrated.

(1) Adjust the analyzer to optimize performance.

(2) Zero the carbon monoxide analyzer with either zero-grade air or zero-grade nitrogen.

(3) Calibrate on each normally used operating range with carbon monoxide in N_2 calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. Additional calibration points may be generated. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit nonlinear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

§ 86.123-78 Oxides of nitrogen analyzer calibration.

The chemiluminescent oxides of nitrogen analyzer shall receive the following initial and periodic calibration.

(a) Prior to its introduction into service and weekly thereafter the chemiluminescent oxides of nitrogen analyzer shall be checked for NO_2 to NO converter efficiency. Figure B78-9 is a reference for the following steps:

(1) Follow the manufacturer's instructions for instrument startup and operation. Adjust the analyzer to optimize performance.

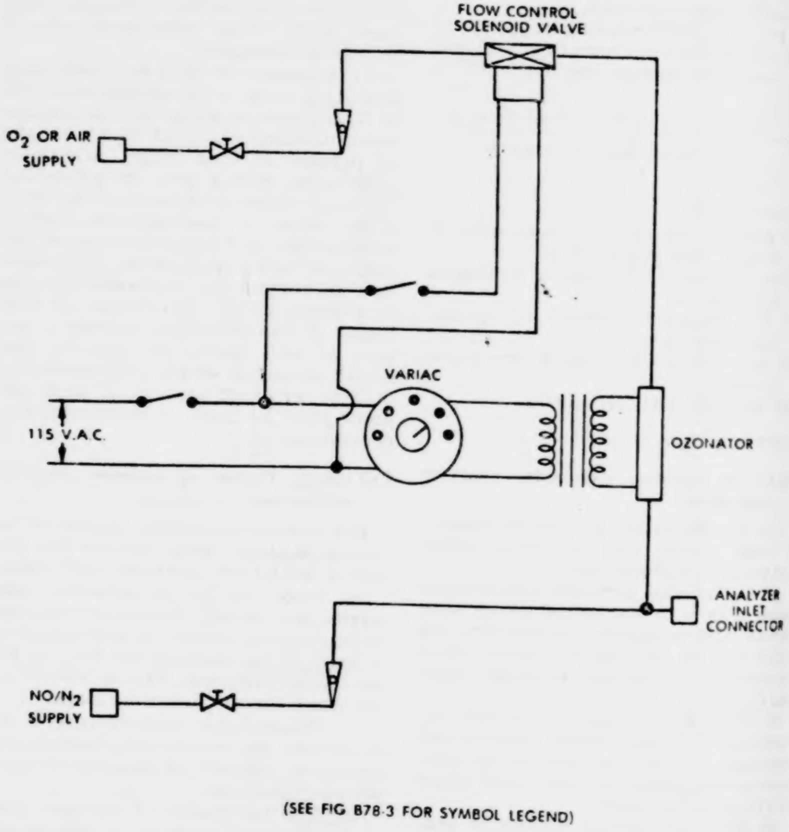
(2) Zero the oxides of nitrogen analyzer with zero-grade air or zero-grade nitrogen.

(3) Connect the outlet of the NOx generator to the sample inlet of the oxides of nitrogen analyzer which has been set to the most common operating range.

(4) Introduce into the NOx generator analyzer-system an NO in nitrogen (N_2) mixture with an NO concentration equal to approximately 80 percent of the most common operating range. The NO_2 content of the gas mixture

shall be less than 5 percent of the NO concentration.

(5) With the oxides of nitrogen analyzer in the NO mode, record the concentration of NO indicated by the an lyzer.


FLOW CONTROL
SOLENOID VALVE
O_2 OR AIR
SUPPLY
VARIAC
115 V.A.C.
OZONATOR
ANALYZER
INLET
CONNECTOR
NO/N_2
SUPPLY

(SEE FIG B78-3 FOR SYMBOL LEGEND)

FIGURE B78-9—NOx CONVERTER EFFICIENCY DETECTOR

(6) Turn on the NOx generator O_2 (or air) supply and adjust the O_2 (or air) flow rate so that the NO indicated by the analyzer is about 10 percent less than indicated in step (5). Record the concentration of NO in this $NO+O_2$ mixture.

(7) Switch the NOx generator to the generation mode and adjust the generation rate so that the NO measured

on the analyzer is 20 percent of that measured in step (5). There must be at least 10 percent unreacted NO at this point. Record the concentration of residual NO.

(8) Switch the oxides of nitrogen analyzer to the NOx mode and measure total NOx. Record this value.

(9) Switch off the NOx generation but maintain gas flow through the system. The oxides of nitrogen analyzer will indicate the NOx in the NO+O_2 mixture. Record this value.

(10) Turn off the NOx generator O_2 (or air) supply. The analyzer will now indicate the NOx in the original NO in N_2 mixture. This value should be no more than 5 percent above the value indicated in step (4).

(11) Calculate the efficiency of the NO_x converted by substituting the concentrations obtained into the following equation:

$$\text{Percent Efficiency} = [1 + (a-b)/(c-d)] \times 100$$

where:

a=concentration obtained in step (8).
b=concentration obtained in step (9).
c=concentration obtained in step (6).
d=concentration obtained in step (7).

If converter efficiency is not greater than 90 percent corrective action will be required.

(b) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter the chemiluminescent oxides of nitrogen analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate as when analyzing samples. Proceed as follows:

(1) Adjust analyzer to optimize performance.

(2) Zero the oxides of nitrogen analyzer with zero-grade air or zero-grade nitrogen.

(3) Calibrate on each normally used operating range with NO in N2 calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

[42 FR 32954, June 28, 1977, as amended at 42 FR 45652, Sept. 12, 1977; 52 FR 47869, Dec. 16, 1987]

§ 86.124-78 Carbon dioxide analyzer calibration.

Prior to its introduction into service and monthly thereafter the NDIR carbon dioxide analyzer shall be calibrated:

(a) Follow the manufacturer's instructions for instrument startup and operation. Adjust the analyzer to optimize performance.

(b) Zero the carbon dioxide analyzer with either zero-grade air or zero-grade nitrogen.

(c) Calibrate on each normally used operating range with carbon dioxide in N_2 calibration gases with nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. Additional calibration points may be generated. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

§ 86.126-78 Calibration of other equipment.

Other test equipment used for testing shall be calibrated as often as required by the manufacturer or as necessary according to good practice.

§ 86.126-90 Calibration of other equipment.

Other test equipment used for testing shall be calibrated as often as required by the manufacturer or as necessary according to good practice. Specific equipment requiring calibration are the gas chromatograph and flame ionization detector used in measuring methanol and the high pressure liquid chromatograph (HPLC) and ultraviolet detector for measuring formaldehyde.

[54 FR 14527, Apr. 11, 1989]

§ 86.127-82 Test procedures; overview.

The procedures described in this and subsequent sections are used to determine the conformity of vehicles with the standards set forth in subpart A for light-duty vehicles and light-duty trucks.

(a) The overall test consists of prescribed sequences of fueling, parking and operating conditions. Vehicles are tested for any or all of the following emissions:

(1) Gaseous exhaust HC, CO, NO_x, CO_2 (both gasoline-fueled and diesel vehicles).

(2) Particulates (diesels only).

(3) Evaporative HC (gasoline-fueled vehicles only).

The evaporative portion of the test procedure occurs before and after the exhaust emission test, and in some cases, during the exhaust emission test.

(b) The gasoline-fueled exhaust emission test is designed to determine hydrocarbon, carbon monoxide, and oxides of nitrogen mass emissions while simulating an average trip in an urban area of 7.5 miles (12.1 kilometers). The test consists of engine startups and vehicle operation on a chassis dynamometer, through a specified driving schedule. A proportional part of the diluted exhaust is collected continuously for subsequent analysis, using a constant volume (variable dilution) sampler or critical flow venturi sampler.

(c) The diesel exhaust emission test is designed to determine particulate and gaseous mass emissions during a test similar to the test in § 86.127-82(b). Dilute exhaust is continuously analyzed for total hydrocarbons using a heated sample line and analyzer. The other gaseous emissions, CO, CO_2 and NO_x are collected continuously for analysis as in § 86.127-82(b). Simultaneous with the gaseous exhaust collection and analysis, particulates from a proportional part of the diluted exhaust are collected continuously on a filter. The mass of particulate is determined by the procedure described in § 86.139. This testing requires a dilution tunnel as well as the constant volume sampler.

(d) The evaporative emission test (gasoline-fueled vehicles only) is designed to determine hydrocarbon evaporative emissions as a consequence of diurnal temperature fluctuation, urban driving, and hot soaks during parking. It is associated with a series of events representative of a motor vehicle's operation, which result in hydrocarbon vapor losses. The test procedure is designed to measure:

(1) Diurnal breathing losses resulting from daily temperature changes, measured by the enclosure technique;

(2) Running losses from suspected sources (if indicated by engineering analysis or vehicle inspection) resulting from a simulated trip on a chassis dynamometer, measured by carbon traps; and

(3) Hot soak losses, which result when the vehicle is parked and the hot engine is turned off, measured by the enclosure technique.

(e) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 86.078-25.

[45 FR 14516, Mar. 5, 1980]

§ 86.127-90 Test procedures; overview.

The procedures described in this and subsequent sections are used to determine the conformity of vehicles with the standards set forth in Subpart A for light-duty vehicles and light-duty trucks.

(a) The overall test consists of prescribed sequences of fueling, parking and operating conditions. Vehicles are tested for any or all of the following emissions:

(1) Gaseous exhaust HC, CO, NO_x, CO_2 (for petroleum-fueled vehicles), plus CH_3OH and HCHO for methanol-fueled vehicles (measurement of CH_3OH and HCHO may be omitted for 1990 through 1994 model year methanol-fueled vehicles provided a HFID calibrated on methanol is used for measuring HC plus CH_3OH).

(2) Particulates (diesel vehicles).

(3) Evaporative HC (for gasoline-fueled and methanol-fueled vehicles) and CH_3OH (for methanol-fueled vehi-

cles). A separate CH_3OH measurement may be omitted for 1990 through 1994 model year methanol-fueled vehicles provided a HFID calibrated on methanol is used for measuring HC plus CH_3OH.

The evaporative portion of the test procedure occurs before and after the exhaust emission test, and in some cases, during the exhaust emission test.

(b) The Otto-cycle exhaust emission test is designed to determine gaseous hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen mass emissions from gasoline-fueled and methanol-fueled vehicles as well as methanol and formaldehyde from methanol-fueled Otto-cycle vehicles while simulating an average trip in an urban area of 7.5 miles (12.1 kilometers). The test consists of engine startups and vehicle operation on a chassis dynamometer, through a specified driving schedule. A proportional part of the diluted exhaust is collected continuously for subsequent analysis, using a constant volume (variable dilution) sampler or critical flow venturi sampler.

(c) The diesel exhaust emission test is designed to determine particulate and gaseous mass emissions during a test similar to the test in § 86.127(b). For petroleum-fueled vehicles, diluted exhaust is continuously analyzed for total hydrocarbons using a heated sample line and analyzer. The other gaseous emissions, CO, CO_2 and NO_x are collected continuously for analysis as in § 86.127(b). For methanol-fueled vehicles, hydrocarbons, methanol, formaldehyde, CO, CO_2, and NO_x are collected continuously for analysis as in § 86.127(b). Hydrocarbons, methanol and formaldehyde are collected using heated sample lines, and a heated FID is used for hydrocarbons analyses. Simultaneous with the gaseous exhaust collection and analysis, particulates from a proportional part of the diluted exhaust are collected continuously on a filter. The mass of particulate is determined by the procedure described in § 86.139. This testing requires a dilution tunnel as well as the constant volume sampler.

(d) The evaporative emission test (gasoline-fueled vehicles and methanol-fueled vehicles) is designed to determine hydrocarbon and methanol evaporative emissions as a consequence of diurnal temperature fluctuation, urban driving, and hot soaks during parking. It is associated with a series of events representative of a motor vehicle's operation, which result in hydrocarbon and/or methanol vapor losses. The test procedure is designed to measure:

(1) Diurnal breathing losses resulting from daily temperature changes, measured by the enclosure technique;

(2) Running losses from suspected sources (if indicated by engineering analysis or vehicle inspection) resulting from a simulated trip on a chassis dynamometer, measured by carbon traps; and

(3) Hot soak losses, which result when the vehicle is parked and the hot engine is turned off, measured by the enclosure technique.

(e) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 86.088-25.

[54 FR 14527, Apr. 11, 1989]

§ 86.128-79 Transmissions.

(a) All test conditions, except as noted, shall be run according to the manufacturer's recommendations to the ultimate purchaser, *Provided*, That: Such recommendations are representative of what may reasonably be expected to be followed by the ultimate purchaser under in-use conditions.

(b) Vehicles equipped with free wheeling or overdrive, except as noted, shall be tested with these features operated according to the manufacturer's recommendations to the ultimate purchaser.

(c) Idle modes shall be run with automatic transmission in "Drive" and the wheels braked; manual transmissions shall be in gear with the clutch disengaged, except first idle (see §§ 86.136 and 86.137).

(d) The vehicle shall be driven with minimum accelerator pedal movement to maintain the desired speed.

(e) Accelerations shall be driven smoothly following representative shift speeds and procedures. For manual transmissions, the operator shall release the accelerator pedal during each shift and accomplish the shift with minimum time. If the vehicle cannot accelerate at the specified rate, the vehicle shall be operated at maximum available power until the vehicle speed reaches the value prescribed for that time in the driving schedule.

(f) The deceleration modes shall be run in gear using brakes or accelerator pedal as necessary to maintain the desired speed. Manual transmission vehicles shall have the clutch engaged and shall not change gears from the previous mode. For those modes which decelerate to zero, manual transmission clutches shall be depressed when the speed drops below 15 mph (24.1 km/h), when engine roughness is evident, or when engine stalling is imminent.

(g)(1) In the case of test vehicles equipped with manual transmissions, the transmission shall be shifted in accordance with procedures which are representative of shift patterns that may reasonably be expected to be followed by vehicles in use, in terms of such variables as vehicle speed or percent rated engine speed. At the Administrator's discretion, a test vehicle may also be shifted according to the shift procedures recommended by the manufacturer to the ultimate purchaser, if such procedures differ from those which are reasonably expected to be followed by vehicles in use.

(2) A manufacturer may recommend to the ultimate purchaser shift procedures other than those used in testing by the EPA, Provided that: All shift procedures (including multiple shift speeds) which the manufacturer proposes to supply to the ultimate purchaser are provided to the Administrator as part of the manufacturer's application for certification, or as an amendment to such application, under § 86.079–32, § 86.079–33, or § 86.079–34.

(h) Downshifting is allowed at the beginning of or during a power mode in accordance with the shift procedure determined in paragraph (g)(1) of this section.

[43 FR 52921, Nov. 14, 1978]

§ 86.129–80 Road load power test weight and inertia weight class determination.

(a) Flywheels, electrical or other means of simulating test weight as shown in the following table shall be used. If the equivalent test weight specified is not available on the dynamometer being used, the next higher equivalent test weight (not to exceed 250 pounds) available shall be used.

Road load power at 50 mi/h—light-duty trucks [1] [2] [3]	Loaded vehicle weight (pounds)	Equivalent test weight (pounds)	Inertia weight class (pounds)
	Up to 1,062	1,000	1,000
	1,063 to 1,187	1,125	1,000
	1,188 to 1,312	1,250	1,250
	1,313 to 1,437	1,375	1,250
	1,438 to 1,562	1,500	1,500
	1,563 to 1,687	1,625	1,500
	1,688 to 1,812	1,750	1,750
	1,813 to 1,937	1,875	1,750
	1,938 to 2,062	2,000	2,000
	2,063 to 2,187	2,125	2,000
	2,188 to 2,312	2,250	2,250
	2,313 to 2,437	2,375	2,250
	2,438 to 2,562	2,500	2,500
	2,563 to 2,687	2,625	2,500
	2,688 to 2,812	2,750	2,750
	2,813 to 2,937	2,875	2,750
	2,938 to 3,062	3,000	3,000
	3,063 to 3,187	3,125	3,000
	3,188 to 3,312	3,250	3,000
	3,313 to 3,437	3,375	3,500
	3,438 to 3,562	3,500	3,500
	3,563 to 3,687	3,625	3,500
	3,688 to 3,812	3,750	3,500
	3,813 to 3,937	3,875	4,000
	3,938 to 4,125	4,000	4,000
	4,126 to 4,375	4,250	4,000
	4,376 to 4,625	4,500	4,500
	4,626 to 4,875	4,750	4,500
	4,876 to 5,125	5,000	5,000
	5,126 to 5,375	5,250	5,000
	5,376 to 5,750	5,500	5,500
	5,751 to 6,250	[4] 6,000	6,000
	6,251 to 6,750	6,500	6,500
	6,751 to 7,250	7,000	7,000
	7,251 to 7,750	7,500	7,500
	7,751 to 8,250	8,000	8,000
	8,251 to 8,750	8,500	8,500
	8,751 to 9,250	9,000	9,000
	9,251 to 9,750	9,500	9,500
	9,751 to 10,000	10,000	10,000

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[1] For all light-duty trucks except vans, and for heavy duty vehicles optionally certified as light-duty trucks, the road load power (horsepower) at 50 mi/h shall be 0.58 times B (defined below) rounded to the nearest ½ hp.

[2] For vans, the road load power at 50 mi/h (horsepower) shall be 0.50 times B (defined below) rounded to the nearest ½ hp.

[3] B is the basic vehicle frontal area (square foot) plus the additional frontal area (square foot) of mirrors and optional equipment exceeding 0.1 ft^2 which are anticipated to be sol

(b) *Power absorption unit adjustment—light-duty trucks.* (1) The power absorption unit shall be adjusted to reproduce road load power at 50 mph true speed. The indicated road load power setting shall take into account the dynamometer friction. The relationship between road load (absorbed) power and indicated road load power for a particular dynamometer shall be determined by the procedure outlined in § 86.118 or other suitable means.

(2) The road load power listed in the table above shall be used or the vehicle manufacturer may determine the road load power by an alternate procedure requested by the manufacturer and approved in advance by the Administrator.

(3) Where it is expected that more than 33 percent of a car line within an engine-system combination will be equipped with air conditioning per § 86.080–24(g)(2), the road load power listed above or as determined in paragraph (b)(2) of this section shall be increased by 10 percent, up to a maximum increase of 1.4 horsepower, for testing all test vehicles representing that car line within that engine-system combination if those vehicles are intended to be offered with air conditioning in production. The above increase for air conditioning shall be added prior to rounding off as instructed by notes 2 and 3 of the table.

(c) *Power absorption unit adjustment—light-duty vehicles.* (1) The power absorption unit shall be adjusted to reproduce road load power at 50 mph true speed. The dynamometer power absorption shall take into account the dynamometer friction, as discussed in § 86.118.

(2) The dynamometer road load setting is determined from the equivalent test weight, the reference frontal area, the body shape, the vehicle protuberances, and the tire type by the following equations.

(i) For light-duty vehicles to be tested on a twin roll dynamometer.

$$Hp = aA + P + tW$$

where:

Hp = the dynamometer power absorber setting at 50 mph (horsepower).

A = the vehicle reference frontal area (ft^2). The vehicle reference frontal area is defined as the area of the orthogonal projection of the vehicle, including tires and suspension components, but excluding vehicle protuberances, onto a plane perpendicular to both the longitudinal plane of the vehicle and the surface upon which the vehicle is positioned. Measurements of this area shall be computed to the nearest tenth of a square foot using a method approved in advance by the Administrator.

P = the protuberance power correction factor from table 1 of this paragraph (horsepower).

W = vehicle equivalent test weight (lbs) from the table in paragraph (a).

a = 0.43 for fastback-shaped vehicles; = 0.50 for all other light duty vehicles.

t = 0.0 for vehicles equipped with radial ply tires; $= 3 \times 10^{-4}$ for all other vehicles.

A vehicle is considered to have a fastback shape if the rearward projection of that portion of the rear surface (A_b) which slopes at an angle of less than 20 degrees from the horizontal is at least 25 percent as large as the vehicle reference frontal area. In addition, this surface must be smooth, continuous, and free from any local transitions greater than four degrees. An example of a fastback shape is presented in Figure 1.

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on more than 33 pct of the car line. Frontal area measurements shall be computed to the nearest 10th of a square foot using a method approved in advanced by the administrator.

[4] Light-duty vehicles over 5,750 lb loaded vehicle weight shall be tested at a 5,500 lb equivalent test weight.

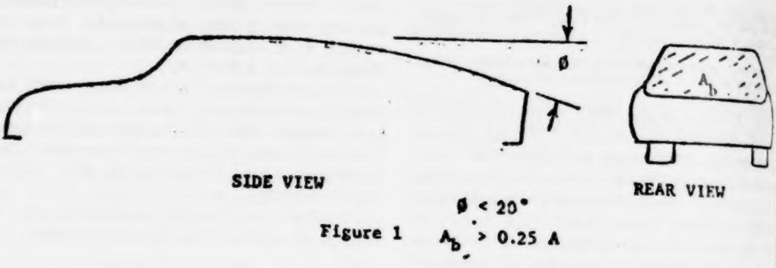


Figure 1

TABLE I—PROTUBERANCE POWER, P. VERSUS TOTAL PROTUBERANCE FRONTAL AREA, A_p

A_p (square foot)	P (horsepower)
$A_p<0.30$	0.0
$0.30\ A_p<0.60$	.40
$0.60\ A_p<0.90$	.70
$0.90\ A_p<1.20$	1.00
$1.20\ A_p<1.50$	1.30
$1.50\ A_p<1.80$	1.60
$1.80\ A_p<2.10$	1.90
$2.10\ A_p<2.40$	2.20
$2.40\ A_p<2.70$	2.50
$2.70\ A_p<3.00$	2.80
$3.00\ A_p$	3.10

The protuberance frontal area, A_p, is defined in a manner analogous to the definition of the vehicle reference frontal area, i.e., the total area of the orthogonal projections of the vehicle mirrors, hood ornaments, roof racks, and other protuberance onto a plane(s) perpendicular to both the longitudinal plane of the vehicle and the surface upon which the vehicle is positioned. A protuberance is defined as any fixture attached to the vehicle protruding more than 1 inch from the vehicle surface and having a projected area greater than 0.01 ft^2 with the area calculated by a method approved in advance by the Administrator. Included in the total protuberance frontal area shall be all fixtures which occur as standard equipment. The area of any optional equipment shall also be included if it is expected that more than 33 percent of the car line sold will be equipped with this option.

(ii) The dynamometer power absorber setting for light-duty vehicles shall be rounded to the nearest 0.1 horsepower.

(iii) For light-duty vehicles to be tested on a single, large roll dynamometer.

$$Hp=aA+P+(5.0\times10^{-4}+0.33t)W$$

All symbols in the above equation are defined in paragraph (c)(2)(i) of this section. The rounding criteria of paragraph (c)(2)(i) also apply to this paragraph.

(3) The road load power calculated above shall be used or the vehicle manufacturer may determine the road load power by an alternate procedure requested by the manufacturer and approved in advance by the Administrator.

(4) Where it is expected that more than 33 percent of a car line within an engine-system combination will be equipped with air conditioning, per § 86.080–24(g)(2), the road load power as determined in paragraph (c) (2) or (3) of this section shall be increased by 10 percent up to a maximum increment of 1.4 horsepower, for testing all test vehicles of that car line within that engine-system combination if those vehicles are intended to be offered with air conditioning in production. This power increment shall be added to the indicated dynamometer power absorption setting prior to rounding off this value.

[42 FR 45653, Sept. 12, 1977, as amended at 43 FR 52921, Nov. 14, 1978]

§ 86.130–78 Test sequence; general requirements.

The test sequence shown in figure B78–10 shows the steps encountered as the test vehicle undergoes the procedures subsequently described to determine conformity with the standards set forth. Ambient temperature levels encountered by the test vehicle shall not be less than 68° F (20° C) nor more than 86° F (30° C). The temperatures monitored during testing must be representative of those experienced by the test vehicle. The vehicle shall be approximately level during all phases of the test sequence to prevent abnormal fuel distribution.

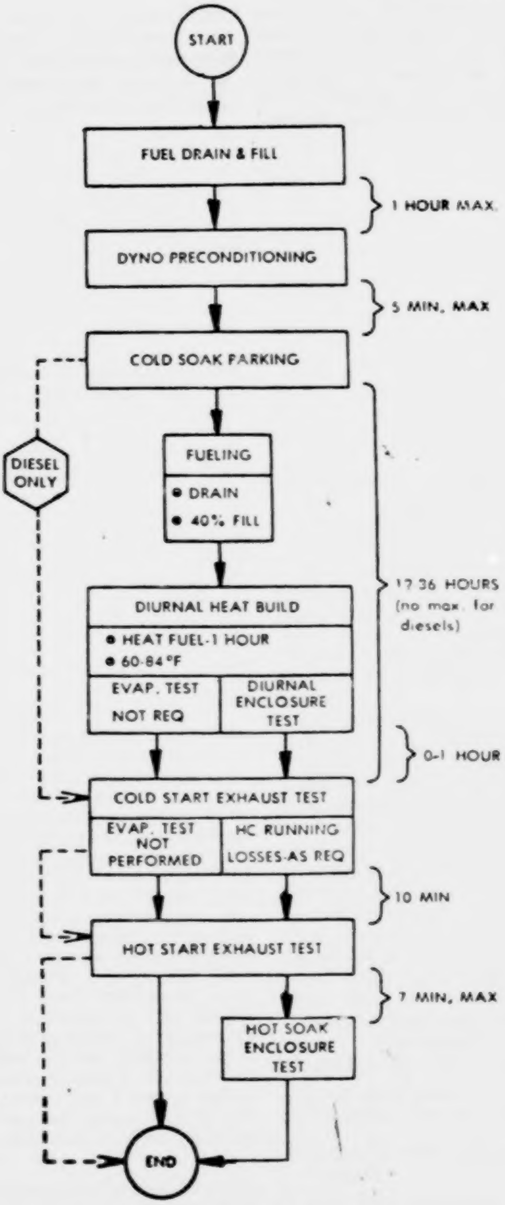

START
FUEL DRAIN & FILL
1 HOUR MAX.
DYNO PRECONDITIONING
5 MIN. MAX
COLD SOAK PARKING
DIESEL ONLY
FUELING
• DRAIN
• 40% FILL
12-36 HOURS (no max. for diesels)
DIURNAL HEAT BUILD
• HEAT FUEL-1 HOUR
• 60-84°F
EVAP. TEST NOT REQ
DIURNAL ENCLOSURE TEST
0-1 HOUR
COLD START EXHAUST TEST
EVAP. TEST NOT PERFORMED
HC RUNNING LOSSES-AS REQ
10 MIN
HOT START EXHAUST TEST
7 MIN. MAX
HOT SOAK ENCLOSURE TEST
END

Figure E78 10 SEQUENCE

§ 86.131-78 Vehicle preparation.

(a) For gasoline-fueled vehicles prepare the fuel tank(s) for recording the temperature of the prescribed test fuel at the approximate mid-volume of the fuel.

(b) Provide additional fittings and adapters, as required, to accommodate a fuel drain at the lowest point possible in the tank(s) as installed on the vehicle.

§ 86.131-90 Vehicle preparation.

(a) For gasoline-fueled and methanol-fueled vehicles prepare the fuel tank(s) for recording the temperature of the prescribed test fuel at the approximate mid-volume of the fuel.

(b) Provide additional fittings and adapters, as required, to accommodate a fuel drain at the lowest point possible in the tank(s) as installed on the vehicle.

[54 FR 14527, Apr. 11, 1989]

§ 86.132-82 Vehicle preconditioning.

(a) The vehicle shall be moved to the test area and the following operations performed:

(1) The fuel tank(s) shall be drained through the provided fuel tank(s) drain(s) and filled to the prescribed "tank fuel volume" with the specified test fuel, § 86.113. For the above operations the evaporative emission control system shall neither be abnormally purged nor abnormally loaded.

(2) Within one hour of being fueled the vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through one Urban Dynamometer Driving Schedule test procedure, see § 86.115 and Appendix I. A test vehicle may not be used to set dynamometer horsepower.

(3) For those unusual circumstances where additional preconditioning is desired by the manufacturer, such preconditioning may be allowed with the advance approval of the Administrator.

(4) The Administrator may also choose to conduct or require the manufacturer to conduct additional preconditioning to insure that the evaporative emission control system is stabilized in the case of gasoline engines, or to insure that the exhaust system is stabilized in the case of diesel engines.

(i) *Gasoline-fueled vehicles.* (A) The additional preconditioning shall consist of an initial one hour minimum soak and, one, two, or three driving cycles of the UDDS, as described in paragraph (a)(2) of this section, each followed by a soak of at least one hour with engine off, engine compartment cover closed and cooling fan off.

(B) The vehicle may be driven off the dynamometer following each UDDS for the soak period.

(ii) *Diesel—fueled vehicles.* The preconditioning shall consist of either of the following:

(A) The additional preconditioning described in paragraph (a)(4)(i) of this section; or

(B) For abnormally treated vehicles, as defined in § 86.085-2, two Highway Fuel Economy Driving Schedules, found in Part 600 Appendix I, run in immediate succession, with the road load power set at twice the value obtained from § 86.129-80.

(b) Within five minutes of completion of preconditioning, the vehicle shall be driven off the dynamometer and parked. The vehicle shall be stored for not less than 12 hours nor for more than 36 hours prior to the cold start exhaust test. (Gasoline-fueled vehicles undergo a one-hour diurnal heat build prior to the cold start exhaust test. A wait of up to one hour is permitted between the end of the diurnal heat build and the beginning of the cold start exhaust test. See § 86.130 and Figure B79-5.)

(c) Vehicles to be tested for evaporative emissions shall be processed in accordance with procedures in §§ 86.133 through 86.138. Vehicles to be tested for exhaust emissions only shall be processed according to §§ 86.133 through 86.137.

[45 FR 14516, Mar. 5, 1980, as amended at 52 FR 47869, Dec. 16, 1987]

§ 86.132-90 Vehicle preconditioning.

(a) The vehicle shall be moved to the test area and the following operations performed:

(1) The fuel tank(s) shall be drained through the provided fuel tank(s) drain(s) and filled to the prescribed

"tank fuel volume" with the specified test fuel, § 86.113. For the above operations the evaporative emission control system shall neither be abnormally purged nor abnormally loaded.

(2) Within one hour of being fueled the vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through one Urban Dynamometer Driving Schedule test procedure, see § 86.115 and Appendix I. A test vehicle may not be used to set dynamometer horsepower.

(3) For those unusual circumstances where additional preconditioning is desired by the manufacturer, such preconditioning may be allowed with the advance approval of the Administrator.

(4) The Administrator may also choose to conduct or require the conduct of additional preconditioning to insure that the evaporative emission control system is stabilized in the case of gasoline-fueled and methanol-fueled vehicles, or to insure that the exhaust system is stabilized in the case of petroleum-fueled and methanol-fueled diesel vehicles.

(i) *Gasoline-fueled and methanol-fueled vehicles.* (A) The additional preconditioning shall consist of an initial one hour minimum soak and, one, two, or three driving cycles of the UDDS, as described in (a)(2) of this section, each followed by a soak of at least one hour with engine off, engine compartment cover closed and cooling fan off.

(B) The vehicle may be driven off the dynamometer following each UDDS for the soak period.

(ii) *Petroleum-fueled diesel vehicles.* The preconditioning shall consist of either of the following:

(A) The additional preconditioning described in paragraph (a)(4)(i) of this section; or

(B) For abnormally treated vehicles, as defined in § 86.085-2, two Highway Fuel Economy Driving Schedules, found in Part 600 Appendix I, run in immediate succession, with the road load power set at twice the value obtained from § 86.129-80.

(b) Within five minutes of completion of preconditioning, the vehicle shall be driven off the dynamometer and parked. The vehicle shall be stored for not less than 12 hours nor for more than 36 hours prior to the cold start exhaust test. (Gasoline-fueled and methanol-fueled vehicles undergo a one-hour diurnal heat build prior to the cold start exhaust test. A wait of up to one hour is permitted between the end of the diurnal heat build and the beginning of the cold start exhaust test. See § 86.130 and Figure B79-5.)

(c) Vehicles to be tested for evaporative emissions shall be processed in accordance with procedures in §§ 86.132 through 86.138. Vehicles to be tested for exhaust emissions only shall be processed according to § 86.132 through § 86.137.

[54 FR 14527, Apr. 11, 1989]

§ 86.133-78 Diurnal breathing loss test.

(a)(1) Following vehicle preparation and vehicle preconditioning procedures described in §§ 86.131 and 86.132 the test vehicle shall be allowed to soak for a period of not less than 12 or more than 36 hours prior to the exhaust emission test. The diurnal test shall start not less than 10 or more than 35 hours after the end of the preconditioning procedure. The start of the exhaust test shall follow the end of the diurnal test within one hour.

(2) Gasoline-fueled vehicles to be tested for exhaust emissions only shall undergo the diurnal heat build. Since no evaporative measurements are necessary, an evaporative enclosure is not required.

(b) The evaporative emission enclosure shall be purged for several minutes immediately prior to the test.

NOTE: If at anytime the hydrocarbon concentration exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides a 4:1 safety factor against the lean flammability limit.

(c) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(d) If not already on, the evaporative enclosure mixing fan shall be turned on at this time.

(e) Immediately prior to the diurnal breathing loss test, the fuel tank(s) of the prepared vehicle shall be drained and recharged with the specified test fuel, § 86.113, to the prescribed "tank fuel volume," defined in § 86.078-2

The temperature of the fuel prior to its delivery to the fuel tank shall be between 45 and 60° F (7.2 and 16° C). The fuel tank cap(s) is not installed until the diurnal heat build begins.

(f) The test vehicle, with the engine shut off, shall be moved into the evaporative emission enclosure, the test vehicle windows and luggage compartments shall be opened, the fuel tank temperature sensor shall be connected to the temperature recording system, and, if required, the heat source shall be properly positioned with respect to the fuel tank(s) and/or connected to the temperature controller.

(g) The temperature recording system shall be started.

(h) The fuel may be artificially heated to the starting diurnal temperature.

(i) When the fuel temperature recording system reaches at least 58° F (14° C), immediately:

(1) Install fuel tank cap(s).

(2) Turn off purge blowers, if not already off at this time.

(3) Close and seal enclosure doors.

(j) When the fuel temperature recording system reaches 60±2° F (16±1.1° C), immediately:

(1) Analyze enclosure atmosphere for hydrocarbons and record. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCi}. § 86.143.

(2) Start diurnal heat build and record time. This commences the 60±2 minute test period.

(k) The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±3° F (±1.6° C):

$$F=T_o+0.4t$$

for SI units,

$$C=T_o+(2/9)t$$

where:

F=fuel temperature, °F
C=fuel temperature, °C
t=time since beginning of test, minutes.
T_o=initial temperature.

After 60±2 minutes of heating, the fuel temperature rise shall be 24±1° F (14° C (±0.5° C)).

(l) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the diurnal test.

(m) The end of the diurnal breathing loss test occurs 60±2 minutes after the heat build begins, paragraph (j)(2). Analyze the enclosure atmosphere for hydrocarbons and record. This is the final (time=60 minutes) hydrocarbon concentration, C_{HCF} § 86.143. The time (or elapsed time) of this analysis shall be recorded.

(n) The heat source shall be turned off and the enclosure doors unsealed and opened.

(o) The heat source shall be moved away from the vehicle, if required, and/or disconnected from the mperature controller, the fuel tank temperature sensor shall be disconnected from the temperature recording system, the test vehicle windows and luggage compartments may be closed and the test vehicle, with the engine shut off, shall be removed from the evaporative emission enclosure.

(p) For vehicles with multiple tanks, the largest tank shall be designated as the primary tank and shall be heated in accordance with the procedures described in paragraph (k) of this section. All other tanks shall be designated as auxiliary tanks and shall undergo a similar heat build such that the fuel temperature shall be within 3° F (1.6° C) of the primary tank.

[42 FR 32954, June 28, 1977, as amended at 48 FR 52202, Nov. 16, 1983]

§ 86.133-90 Diurnal breathing loss test.

(a)(1) Following vehicle preparation and vehicle preconditioning procedures described in §§ 86.131 and 86.132 the test vehicle shall be allowed to soak for a period of not less than 12 or more than 36 hours prior to the exhaust emission test. The diurnal test shall start not less than 10 or more than 35 hours after the end of the preconditioning procedure. The start of the exhaust test shall follow the end of the diurnal test within one hour.

(2) Gasoline-fueled and methanol-fueled vehicles to be tested for exhaust emissions only shall undergo the diurnal heat build. Since no evaporative measurements are necessary, an evaporative enclosure is not required.

(b) The evaporative emission enclosure shall be purged for several minutes immediately prior to the test.

NOTE: If at any time the concentration of hydrocarbons, of methanol or of methanol and hydrocarbons exceeds 15,000 ppm C the enclosure should be immediately purged. The concentration provides a 4:1 safety factor of hydrocarbons and methanol against the lean flammability limit.

(c) The FID (or HFID) hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(d) Impingers charged with known volumes of pure deionized water shall be placed in the methanol sampling system (methanol-fueled vehicles only).

(e) If not already on, evaporative enclosure mixing fan shall be turned on at this time.

(f) Immediately prior to the diurnal breathing loss test, the fuel tank(s) of the prepared vehicle shall be drained and recharged with the specified test fuel, § 86.113, to the prescribed "tank fuel volume," defined in § 86.078-2. The temperature of the fuel prior to its delivery to the fuel tank shall be between 45° and 60 °F (7.2 °C and 16 °C). The fuel tank cap(s) is not installed until the diurnal heat build begins.

(g) The test vehicle, with the engine shut off, shall be moved into the evaporative emission enclosure, the test vehicle windows and luggage compartment(s) shall be opened, the fuel tank temperature sensor shall be connected to the temperature recording system, and, if required, the heat source shall be properly positioned with respect to the fuel tank(s) and/or connected to the temperature controller.

(h) The temperature recording system shall be started.

(i) The fuel may be artificially heated to the starting diurnal temperature.

(j) When the fuel temperature recording system reaches at least 58 °F (14 °C), immediately:

(1) Install fuel tank cap(s).

(2) Turn off purge blowers, if not already off at this time.

(3) Close and seal enclosure doors.

(k) When the fuel temperature recording system reaches 60°±2 °F (16°±1.1 °C), immediately:

(1) Analyze enclosure atmosphere for hydrocarbons and record. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCi}, § 86.143.

(2) Simultaneously with initiation of the hydrocarbon analysis, initiate collection of the methanol sample by drawing a sample from the enclosure through the sampling system for four minutes. This is the initial methanol measurement from which methanol concentration C_{CH3OHi} and mass are calculated. Remove impingers and replace with freshly charged clean impingers which will be used to collect the final methanol sample.

(3) Start diurnal heat build and record time. This commences the 60±2 minute test period.

(l) The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±3 °F (±1.6 °C):

(1) $F=T_o+0.4t$.

(2) For SI units, $C=T_o+(2/9)t$.

Where:

(3) F=fuel temperature, °F.

(4) C=fuel temperature, °C.

(5) t=time since beginning of test, minutes.

(6) T_o=initial temperature.

After 60±2 minutes of heating, the fuel temperature rise shall be 24°±1 °F (13.4 °C±0.5 °C).

(m) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the diurnal test.

(n) The end of the diurnal breathing loss test occurs 60±2 minutes after the heat build begins, paragraph (j)(2). Analyze the enclosure atmosphere for hydrocarbons and record. This is the final (time=60 minutes) hydrocarbon concentration, C_{HCf}, § 86.143. The time (or elapsed time) of this analysis shall be recorded.

(o) Simultaneously with the start of the hydrocarbon analysis, initiate collection of the methanol sample. Sample for 4.0±0.5 minutes. This is the final methanol sample.

(p) *Alternate method for methanol sampling.* Since sample times of longer than four minutes may be necessary in order to collect an adequate and representative sample of methanol at the end of a test (when SHED concentrations are usually increasing rapidly), it may be necessary to rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flowing through the impingers should be minimized in order to prevent any losses. This alternative must be adopted if the four minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis.

(q) Once the final methanol sample has been collected, the heat source shall be turned off and the enclosure doors unsealed and opened.

(r) The heat source shall be moved away from the vehicle, if required, and/or disconnected from the temperature controller, the fuel tank temperature sensor shall be disconnected from the temperature recording system, the test vehicle windows and luggage compartments may be closed and the test vehicle, with the engine shut off, shall be removed from the evaporative emission enclosure.

(s) For vehicles with multiple tanks, the largest tank shall be designated as the primary tank and shall be heated in accordance with the procedures described in paragraph (1) of this section. All other tanks shall be designated as auxiliary tanks and shall undergo a similar heat build such that the fuel temperature shall be within 3°F (1.6°C) of the primary tank.

[54 FR 14528, Apr. 11, 1989]

§ 86.135-82 Dynamometer procedure.

(a) *Overview*—(1) *Gasoline-fueled vehicles.* The dynamometer run consists of two tests, a "cold" start test after a minimum 12-hour and a maximum 36 hour soak according to the provisions of §§ 86.132 and 86.133, and a "hot" start test following the "cold" start test by 10 minutes. Engine startup (with all accessories turned off), operation over the UDDS and engine shutdown make a complete cold start test. Engine startup and operation over the first 505 seconds of the driving schedule complete the hot start test. The exhaust emissions are diluted with ambient air and a continuously proportional sample is collected for analysis during each phase. The composite samples collected in bags are analyzed for hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen. A parallel sample of the dilution air is similarly analyzed for hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen.

(2) *Diesel vehicles.* The dynamometer run consists of two tests, a "cold" start test after a minimum 12 hours soak and a maximum 36-hour soak according to the provisions of §§ 86.132 and 86.133, and a "hot" start test following the "cold" start by 10 minutes. Engine startup (with all accessories turned off), operation over the UDDS and engine shutdown make a complete cold start test. Engine startup and operation over the first 505 seconds of the driving schedule complete the hot start test. The exhaust emissions are diluted with ambient air in the dilution tunnel as shown in Figure B82-3 (and Figure B82-4). Six particulate samples are collected on filters for weighing; the first sample plus backup is collected during the first 505 seconds of the cold start test; the second sample plus back-up is collected during the remainder of the cold start test (including shutdown); the third sample plus back-up is collected during the hot start test. Continuous proportional samples of gaseous emissions are collected for analysis during each test phase. The composite samples collected in bags are analyzed for carbon monoxide, carbon dioxide, and oxides of nitrogen. Hydrocarbons are sampled and analyzed continuously according to the provisions of § 86.110. Parallel samples of the dilution air are similarly analyzed for hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen.

(b) During dynamometer operation, a fixed speed cooling fan shall be positioned so as to direct cooling air to the vehicle in an appropriate manner with the engine compartment cover open. In the case of vehicles with front engine compartments, the fan shall be squarely positioned within 12 inches (30.5 centimeters) of the vehicle. In the case vehicles with rear engine compartments (or if special designs make the above impractical), the cooling fan shall be placed in a position to provide sufficient air to maintain vehicle cooling. The fan capacity shall normally not exceed 5300 cfm (2.50 cubic meters per second). If, however, the manufacturer can show that during field operation the vehicle receives additional cooling, and that such additional cooling is needed to provide a representative test, the fan capacity may be increased or additional fans used if approved in advance by the Administrator.

(c) The vehicle speed as measured from the dynamometer rolls shall be used. A speed vs. time recording, as evidence of dynamometer test validity, shall be supplied on request of the Administrator.

(d) Practice runs over the prescribed driving schedule may be performed at test point, provided an emission sample is not taken, for the purpose of finding the minimum throttle action to maintain the proper speed-time relationship, or to permit sampling system adjustment.

Note: When using two-roll dynamometers a truer speed-time trace may be obtained by minimizing the rocking of the vehicle in the rolls; the rocking of the vehicle changes the tire rolling radius on each roll. This rocking may be minimized by restraining the vehicle horizontally (or nearly so) by using a cable and winch.

(e) The drive wheel tires may be inflated up to a gauge pressure of 45 psi (310 kPa) in order to prevent tire damage. The drive wheel tire pressure shall be reported with the test results.

(f) If the dynamometer has not been operated during the 2 hour period immediately preceding the test it shall be warmed up for 15 minutes by operating at 30 mph (48 kph) using a non-test vehicle or as recommended by the dynamometer manufacturer.

(g) If the dynamometer horsepower must be adjusted manually, it shall be set within 1 hour prior to the exhaust emissions test phase. The test vehicle shall not be used to make this adjustment. Dynamometers using automatic control of preselectable power settings may be set anytime prior to the beginning of the emissions test.

(h) The driving distance as measured by counting the number of dynamometer roll or shaft revolutions, shall be determined for the transient cold start, stabilized cold start, and transient hot start phases of the test. The revolutions shall be measured on the same roll or shaft used for measuring the vehicle's speed.

(i) Four-wheel drive vehicles will be tested in a two-wheel drive mode of operation. Full time four-wheel drive vehicles will have one set of drive wheels temporarily disengaged by the vehicle manufacturer. Four-wheel drive vehicles which can be manually shifted to a two-wheel drive mode will be tested in the normal on-highway two-wheel drive mode of operation.

(Approved by the Office of Management and Budget under control number 2000-0390)

[45 FR 14517, Mar. 5, 1980, as amended at 49 FR 48138, Dec. 10, 1984]

§ 86.135–90 Dynamometer procedure.

(a) *Overview*—(1) *Gasoline-fueled and methanol-fueled Otto-cycle vehicles.* The dynamometer run consists of two tests, a "cold" start test after a minimum 12-hour and a maximum 36-hour soak according to the provisions of §§ 86.132 and 86.133, and a "hot" start test following the "cold" start test by 10 minutes. Engine startup (with all accessories turned off), operation over the UDDS and engine shutdown make a complete cold start test. Engine startup and operation over the first 505 seconds of the driving schedule complete the hot start test. The exhaust emissions are diluted with ambient air and a continuously proportional sample is collected for analysis during each phase. The composite samples collected in bags are analyzed for hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen. A parallel sample of the dilution air is similarly analyzed for hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen. Methanol and formaldehyde samples (exhaust and dilution air) are collected and analyzed for methanol-fueled vehicles (a single dilution air formaldehyde sample covering the total time of the test may be collected in place of three individual samples). Methanol and formaldehyde samples may be omitted for 1990 through 1994 model years when a FID calibrated on methanol is used.

(2) *Petroleum-fueled and methanol-fueled diesel vehicles.* The dynamome-

ter run consists of two tests, a "cold" start test after a minimum 12-hour and a maximum 36-hour soak according to the provisions of §§ 86.132 and 86.133, and a "hot" start test following the "cold" start by 10 minutes. Engine startup (with all accessories turned off), operation over the UDDS, and engine shutdown make a complete cold start test. Engine startup and operation over the first 505 seconds of the driving schedule complete the hot start test. The exhaust emissions are diluted with ambient air in the dilution tunnel as shown in Figure B90–5 and Figure B90–6. Six particulate samples are collected on filters for weighing; the first sample plus back-up is collected during the first 505 seconds of the cold start test; the second sample plus back-up is collected during the remainder of the cold start test (including shutdown); the third sample plus back-up is collected during the hot start test. Continuous proportional samples of gaseous emissions are collected for analysis during each test phase. For petroleum-fueled vehicles, the composite samples collected in bags are analyzed for carbon monoxide, carbon dioxide, and oxides of nitrogen. Hydrocarbons from petroleum-fueled vehicles are sampled and analyzed continuously according to the provisions of § 86.110. Parallel samples of the dilution air are similarly analyzed for hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen. For methanol-fueled vehicles, bag samples are collected and analyzed for hydrocarbons, carbon monoxide, carbon dioxide, and oxides of nitrogen. Methanol and formaldehyde samples are taken for both exhaust emissions and dilution air (a single dilution air formaldehyde sample, covering the total test period may be collected). Methanol and formaldehyde samples may be omitted for 1990 through 1994 model years when an FID calibrated on methanol is used. Parallel bag samples of dilution air are analyzed for hydrocarbons, carbon monoxide, carbon dioxide, and oxides of nitrogen.

(b) During dynamometer operation, a fixed speed cooling fan shall be positioned so as to direct cooling air to the vehicle in an appropriate manner with the engine compartment cover open. In the case of vehicles with front engine compartments, the fan shall be squarely positioned within 12 inches (30.5 centimeters) of the vehicle. In the case of vehicles with rear engine compartments (or if special designs make the above impractical), the cooling fan shall be placed in a position to provide sufficient air to maintain vehicle cooling. The fan capacity shall normally not exceed 5300 cfm (2.50 m^3/s). If, however, the manufacturer can show that during field operation the vehicle receives additional cooling, and that such additional cooling is needed to provide a representative test, the fan capacity may be increased or additional fans used if approved in advance by the Administrator.

(c) The vehicle speed as measured from the dynamometer rolls shall be used. A speed *vs.* time recording, as evidence of dynamometer test validity, shall be supplied on request of the Administrator.

(d) Practice runs over the prescribed driving schedule may be performed at test point, provided an emission sample is not taken, for the purpose of finding the minimum throttle action to maintain the proper speed-time relationship, or to permit sampling system adjustment.

NOTE: When using two-roll dynamometers a truer speed-time trace may be obtained by minimizing the rocking of the vehicle in the rolls; the rocking of the vehicle changes the tire rolling radius on each roll. This rocking may be minimized by restraining the vehicle horizontally (or nearly so) by using a cable and winch.

(e) The drive wheel tires may be inflated up to a gauge pressure of 45 psi (310 kPa) in order to prevent tire damage. The drive wheel tire pressure shall be reported with the test results.

(f) If the dynamometer has not been operated during the 2-hour period immediately preceding the test, it shall be warmed up for 15 minutes by operating at 30 mph (48 kph) using a non-test vehicle or as recommended by the dynamometer manufacturer.

(g) If the dynamometer horsepower must be adjusted manually, it shall be set within 1 hour prior to the exhaust emissions test phase. The test vehicle shall not be used to make this adjustment. Dynamometers using automatic control of preselectable power settings may be set anytime prior to the beginning of the emissions test.

(h) The driving distance, as measured by counting the number of dynamometer roll or shaft revolutions, shall be determined for the transient cold start, stabilized cold start, and transient hot start phases of the test. The revolutions shall be measured on the same roll or shaft used for measuring the vehicle's speed.

(i) Four-wheel drive vehicles will be tested in a two-wheel drive mode of operation. Full-time four-wheel drive vehicles will have one set of drive wheels temporarily disengaged by the vehicle manufacturer. Four-wheel drive vehicles which can be manually shifted to a two-wheel mode will be tested in the normal on-highway two-wheel drive mode of operation.

[54 FR 14529, Apr. 11, 1989]

§ 86.136-82 Engine starting and restarting.

(a) *Gasoline-fueled vehicles.* This paragraph (a) applies to gasoline-fueled vehicles.

(1) The engine shall be started according to the manufacturer's recommended starting procedures in the owner's manual. The initial 20-second idle period shall begin when the engine starts.

(2) *Choke operation:* (i) Vehicles equipped with automatic chokes shall be operated according to the manufacturer's operating instructions in the owner's manual, including choke setting and "kick-down" from cold fast idle.

(ii) Vehicles equipped with manual chokes shall be operated according to the manufacturer's operating instructions in the owner's manual.

(3) The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

(4) The operator may use the choke, accelerator pedal, etc., where necessary to keep the engine running.

(5) If the manufacturer's operating instructions in the owner's manual do not specify a warm engine starting procedure, the engine (automatic- and manual-choke engines) shall be started by depressing the accelerator pedal about half way and cranking the engine until it starts.

(b) *Diesel vehicles.* The engine shall be started according to the manufacturer's recommended starting procedures in the owner's manual. The initial 20-second idle period shall begin when the engine starts. The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

(c) If the vehicle does not start after 10 seconds of cranking, cranking shall cease and the reason for failure to start shall be determined. The gas flow measuring device on the constant volume sampler (usually a revolution counter) or CFV (and the hydrocarbon integrator and particulate sampling system when testing diesel vehicles, see § 85.135 Dynamometer test runs) shall be turned off and the sampler selector valves placed in the "standby" position during this diagnostic period. In addition, either the CVS should be turned off, or the exhaust tube disconnected from the tailpipe during the diagnostic period. If failure to start is an operational error, the vehicle shall be rescheduled for testing from a cold start.

(1) If a failure to start occurs during the cold portion of the test and is caused by a vehicle malfunction, corrective action of less than 30 minutes duration may be taken (according to § 86.078-25), and the test continued. All sampling system(s) shall be reactivated at the same time cranking begins. When the engine starts, the driving schedule timing sequence shall begin. If failure to start is caused by vehicle malfunction and the vehicle cannot be started, the test shall be voided, the vehicle removed from the dynamometer, and corrective action may be taken according to § 86.078-25. The reason for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

(2) If a failure to start occurs during the hot start portion of the test and is caused by vehicle malfunction, the vehicle must be started within one minute of key on. All sampling

system(s) shall be reactivated at the same time cranking begins. When the engine starts, the driving schedule timing sequence shall begin. If the vehicle cannot be started within one minute of key on, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken (according to § 86.078-25), and the vehicle rescheduled for testing. The reason for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

(d) If the engine "false starts" the operator shall repeat the recommended starting procedure (such as resetting the choke, etc.).

(e) *Stalling:* (1) If the engine stalls during an idle period, the engine shall be restarted immediately and the test continued. If the engine cannot be started soon enough to allow the vehicle to follow the next acceleration as prescribed, the driving schedule indicator shall be stopped. When the vehicle restarts, the driving schedule indicator shall be reactivated.

(2) If the engine stalls during some operating mode other than idle, the driving schedule indicator shall be stopped, the vehicle shall then be restarted and accelerated to the speed required at that point in the driving schedule and the test continued. During acceleration to this point, shifting shall be performed in accordance with § 86.128.

(3) If the vehicle will not restart within one minute, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken, and the vehicle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

[45 FR 14517, Mar. 5, 1980]

§ 86.136-90 Engine starting and restarting.

(a) *Gasoline-fueled and methanol-fueled Otto-cycle vehicles.* Paragraph (a) of this section applies to gasoline-fueled and methanol-fueled Otto-cycle vehicles.

(1) The engine shall be started according to the manufacturer's recommended starting procedures in the owner's manual. The initial 20-second idle period shall begin when the engine starts.

(2) *Choke operation:* (i) Vehicles equipped with automatic chokes shall be operated according to the manufacturer's operating instructions in the owner's manual, including choke setting and "kick-down" from cold fast idle.

(ii) Vehicles equipped with manual chokes shall be operated according to the manufacturer's operating instructions in the owner's manual.

(3) The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

(4) The operator may use the choke, accelerator pedal, *etc.*, where necessary to keep the engine running.

(5) If the manufacturer's operating instructions in the owner's manual do not specify a warm engine starting procedure, the engine (automatic and manual-choke engines) shall be started by depressing the accelerator pedal about half way and cranking the engine until it starts.

(b) *Petroleum-fueled and methanol-fueled diesel vehicles.* The engine shall be started according to the manufacturer's recommended starting procedures in the owner's manual. The initial 20-second idle period shall begin when the engine starts. The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

(c) If the vehicle does not start after 10 seconds of cranking, cranking shall cease and the reason for failure to start shall be determined. The gas flow measuring device on the constant volume sampler (usually a revolution counter) or CFV (and the hydrocarbon integrator and particulate sampling system when testing petroleum-fueled diesel vehicles and the particulate sampling system when testing methanol-fueled diesel vehicles, *see* § 86.137 Dynamometer test runs) shall be turned off and the sampler selector valves, including the methanol sampler, placed in the "standby" position during this diagnostic period. In addition, either the CVS should be turned off, or the exhaust tube disconnected from the tailpipe during the diagnostic period. If failure to start is an operational error, the vehicle shall be rescheduled for testing from a cold start.

(1) If a failure to start occurs during the cold portion of the test and is caused by a vehicle malfunction, corrective action of less than 30 minutes duration may be taken (according to § 86.088-25), and the test continued. All sampling system(s) shall be reactivated at the same time cranking begins. When the engine starts, the driving schedule timing sequence shall begin. If failure to start is caused by vehicle malfunction and the vehicle cannot be started, the test shall be voided, the vehicle removed from the dynamometer, and corrective action may be taken according to § 86.088-25. The reason for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

(2) If a failure to start occurs during the hot start portion of the test and is caused by vehicle malfunction, the vehicle must be started within one minute of key on. All sampling system(s) shall be reactivated at the same time cranking begins. When the engine starts, the driving schedule timing sequence shall begin. If the vehicle cannot be started within one minute of key on, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken (according to § 86.088-25), and the vehicle rescheduled for testing. The reason for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

(d) If the engine "false starts" the operator shall repeat the recommended starting procedure (such as resetting the choke, *etc.*).

(e) *Stalling:* (1) If the engine stalls during an idle period, the engine shall be restarted immediately and the test continued. If the engine cannot be started soon enough to allow the vehicle to follow the next acceleration as prescribed, the driving schedule indicator shall be stopped. When the vehicle restarts, the driving schedule indicator shall be reactivated.

(2) If the engine stalls during some operating mode other than idle, the driving schedule indicator shall be stopped, the vehicle shall then be restarted and accelerated to the speed required at that point in the driving schedule and the test continued. During acceleration to this point, shifting shall be performed in accordance with § 86.128.

(3) If the vehicle will not restart within one minute, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken, and the vehicle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

[54 FR 14530, Apr. 11, 1989]

§ 86.137-82 Dynamometer test run, gaseous and particulate emissions.

(a) *General*—(1) *Gasoline-fueled vehicles.* The vehicle shall be allowed to stand with the engine turned off for a period of not less than 12 hours or more than 36 hours before the cold start exhaust emission test. The cold start exhaust test shall follow the diurnal breathing loss test by not more than one hour. The vehicle shall be stored prior to the emission test in such a manner that precipitation (e.g., rain or dew) does not occur on the vehicle. The complete dynamometer test consists of a cold start drive of 7.5 miles (12.1 kilometers) and simulates a hot start drive of 7.5 miles (12.1 kilometers). The vehicle is allowed to stand on the dynamometer during the 10 minute time period between the cold and hot start tests. The cold start test is divided into two periods. The first period, representing the cold start "transient" phase, terminates at the end of the deceleration which is scheduled to occur at 505 seconds of the driving schedule. The second period, representing the "stabilized" phase, consists of the remainder of the driving schedule including engine shutdown. The hot start test, similarly, consists of two periods. The first period, representing the hot start "transient" phase, terminates at the same point in driving schedule as the first period of the cold start test. The second period of the hot start test, "stabilized" phase, is assumed to be identical to the second period of the cold start test. Therefore, the hot start test terminates after the first period (505 seconds) is run.

(2) *Diesel vehicles.* The vehicle shall be allowed to stand with the engine turned off for a period of not less than 12 hours or more than 36 hours before the cold start exhaust emission test. The vehicle shall be stored prior to the emission test in such a manner that precipitation (e.g., rain or dew) does not occur on the vehicle. The complete dynamometer test consists of a cold start drive of 7.5 miles (12.1 km), and simulates a hot start drive of 7.5 miles (12.1 km). The vehicle is allowed to stand on the dynamometer during the 10 minute time period between the cold and hot start tests. The cold start test is divided into two periods. The first period, representing the cold start "transient" phase, terminates at the end of the deceleration which is scheduled to occur at 505 seconds of the driving schedule. The second period, representing the "stabilized" phase, consists of the remainder of the driving schedule including engine shutdown. The hot start test, similarly, consists of two periods. The first period, representing the start of the "transient" phase, terminates at the same point in the driving schedule as the first period of the cold start test. The second period of the hot start test, "stabilized" phase, is assumed to be identical to the second period of the cold start test. Therefore, the hot start test terminates after the first period (505 seconds) is run.

(b) The following steps shall be taken for each test:

(1) Place drive wheels of vehicle on dynamometer without starting engine.

(2) Open the vehicle engine compartment cover and position the cooling fan.

(3) With the sample selector valves in the "standby" position connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(4) Start the CVS (if not already on), the sample pumps (except the diesel particulate sample pump, if applicable), the temperature recorder, the vehicle cooling fan, and the heated hydrocarbon analysis recorder (diesels only). (The heat exchanger of the constant volume sampler, if used, diesel hydrocarbon analyzer continuous sample line and filter, if applicable, should be preheated to their respective operating temperatures before the test begins.)

(5) Adjust the sample flow rates to the desired flow rate and set the gas flow measuring devices to zero.

(i) For gaseous samples (except hydrocarbon samples), the minimum flow rate is 0.17 cfm (0.08 1/s).

(ii) For hydrocarbon samples, the minimum FID (or HFID in the case of diesels) flow rate is 0.067 cfm (0.031 1/sec).

NOTE: CFV sample flow rate is fixed by the venturi design.

(6) Attach the exhaust tube to the vehicle tailpipe(s).

(7) Carefully install a particulate sample filter into each of the filter holders for diesel tests. The filters must be handled only with forceps or tongs. Rough or abrasive filter handling will result in erroneous weight determination.

(8) Start the gas flow measuring device, position the sample selector valves to direct the sample flow into the "transient" exhaust sample bag and the "transient" dilution air sample bag (turn on the diesel hydrocarbon analyzer system integrator, mark the recorder chart, start particulate sample pump No. 1, and record both gas meter or flow measurement instrument readings, if applicable), turn the key on, and start cranking the engine.

(9) Fifteen seconds after the engine starts, place the transmission in gear.

(10) Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule.

(11) Operate the vehicle according to the Urban Dynamometer Driving Schedule (§ 86.115).

NOTE: During diesel testing, adjust the flow rate through the particulate sample probe to maintain a constant value within ±5 percent of the set flow rate. Record the average termperature and pressure at the gas meter or flow instrument inlet. If the set flow rate cannot be maintained because of high particulate loading on the filter, the test shall be terminated. The test shall be rerun using a lower flow rate, or larger diameter filter, or both.

(12) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously switch the sample flows from the "transient" bags to the "stabilized" bags, switch off gas flow measuring device No. 1, (switch off the No. 1 diesel hydrocarbon integrator and the No. 1 particulate sample pump, mark the diesel hydrocarbon recorder chart, and close valves isolating particulate filter No. 1, if applicable) and start gas flow measuring device No. 2 (and start the diesel hydrocarbon integrator No. 2 and the No. 2 particulate sample pump and open valves isolating particulate filter No. 2, if applicable). Before the acceleration which is scheduled to occur at 510 seconds, record the measured roll or shaft revolutions and reset the counter or switch to a second counter. As soon as possible transfer the "transient" exhaust and dilution air samples to the analytical system and process the samples according to § 86.140 obtaining a stabilized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(13) Turn the engine off 2 seconds after the end of the last deceleration (at 1,369 seconds).

(14) Five seconds after the engine stops running, simultaneously turn off gas flow measuring device No. 2 (and the diesel hydrocarbon integrator No. 2, mark the hydrocarbon recorder chart, turn off the No. 2 particulate sample pump and close the valves isolating particulate filter No. 2, if applicable) and position the sample selector valves to the "standby" position (and open the valves isolating particulate filter No. 1, if applicable). Record the measured roll or shaft revolutions, (both gas meter or flow measurement instrumentation readings), and re-set the counter. As soon as possible, transfer the "stabilized" exhaust and dilution air samples to the analytical system and process the samples according to § 86.140, obtaining a stabilized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test. (Carefully remove both pairs of particulate sample filters from their respective holders, and place each in a separate petri dish, and cover, if applicable.)

(15) Immediately after the end of the sample period, turn off the cooling fan and close the engine compartment cover.

(16) Turn off the CVS or disconnect the exhaust tube from the tailpipe(s) of the vehicle.

(17) Repeat the steps in paragraphs (b) (2) through (11) of this section for the hot start test, except only two evacuated sample bags (and only one pair of particulate sample filters if applicable) are required; one bag is for sampling exhaust gas and the other bag is for sampling dilution air. The step in paragraph (b)(8) of this section shall begin between 9 and 11 minutes after the end of the sample period for the cold start test.

(18) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously turn off gas flow measuring device No. 1 (and the diesel hydrocarbon integrator No. 1, mark the diesel hydrocarbon recorder chart and turn off the No. 1 particulate sample pump, if applicable) and position the sample selector valve to the "standby" position. (Engine shutdown is not part of the hot start test sample period.) Record the measured roll or shaft revolutions (and the No. 1 gas meter reading or flow measurement instrument). (Carefully remove the third pair of particulate sample filters from its holder and place in a clean petri dish and cover, if applicable.)

(19) As soon as possible, transfer the hot start "transient" exhaust and dilution air samples to the analytical system and process the samples according to § 86.140 obtaining a stabilized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(20) As soon as possible, and in no case longer than one hour after the end of the hot start phase of the test, transfer the six particulate filters to the weighing chamber for post-test conditioning, if applicable.

(21) Disconnect the exhaust tube from the vehicle tailpipe(s) and drive the vehicle from dynamometer.

(22) The CVS or CFV may be turned off, if desired.

(23) Vehicles to be tested for evaporative emissions will proceed according to § 86.138. For all others this completes the test sequence.

[45 FR 14518, Mar. 5, 1980]

§ 86.137-90 Dynamometer test run, gaseous and particulate emissions.

(a) *General*— (1) *Gasoline-fueled and methanol- fueled Otto-cycle vehicles.* The vehicle shall be allowed to stand with the engine turned off for a period of not less than 12 hours or more than 36 hours before the cold start exhaust emission test. The cold start exhaust test shall follow the diurnal breathing loss test by not more than one hour. The vehicle shall be stored prior to the emission test in such a manner that precipitation (*e.g.*, rain or dew) does not occur on the vehicle. The complete dynamometer test consists of a cold start drive of 7.5 miles (12.1 km) and simulates a hot start drive of 7.5 miles (12.1 km). The vehicle is allowed to stand on the dynamometer during the 10 minute time period between the cold and hot start tests. The cold start test is divided into two periods. The first period, representing the cold start "transient" phase, terminates at the end of the deceleration which is scheduled to occur at 505 seconds of the driving schedule. The second period, representing the "stabilized" phase, consists of the remainder of the driving schedule including engine shutdown. The hot start test, similarly, consists of two periods. The first period, representing the hot start "transient" phase, terminates at the same point in driving schedule as the first period of the cold start test. The second period of the hot start test, "stabilized" phase, is assumed to be identical to the second period of the cold start test. Therefore, the hot start test terminates after the first period (505 seconds) is run.

(2) *Petroleum-fueled and methanol-fueled diesel vehicles.* The vehicle shall be allowed to stand with the engine turned off for a period of not less than 12 hours or more than 36 hours before the cold start exhaust emission test. The vehicle shall be stored prior to the emission test in such a manner that precipitation (*e.g.*, rain or dew) does not occur on the vehicle. The complete dynamometer test consists of a cold start drive of 7.5 miles (12.1 km), and simulates a hot start drive of 7.5 miles (12.1 km). The vehicle is allowed to stand on the dynamometer during the 10 minute time period between the cold and hot start tests. The cold start test is divided into two periods. The first period, representing the cold start "transient" phase, terminates at the end of the deceleration which is scheduled to occur at 505 seconds of the driving schedule. The second period, representing the "stabilized" phase, consists of the remainder of the driving schedule including engine shutdown. The hot start test, similarly, consists of two periods. The first period, representing the start of the "transient" phase, terminates at the same point in the driving schedule as the first period of the cold start test. The second period of the hot start test, "stabilized" phase, is assumed to be identical to the second period of the cold start test. Therefore, the hot start test terminates after the first period (505 seconds) is run.

(b) The following steps shall be taken for each test:

(1) Place drive wheels of vehicle on dynamometer without starting engine.

(2) Open the vehicle engine compartment cover and position the cooling fan.

(3) For all vehicles, with the sample selector valves in the "standby" position, connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(4) For methanol-fueled vehicles, with the sample selector valves in the "standby" position, insert fresh sample collection impingers into the methanol sample collection system, the formaldehyde sample collection system and fresh impingers (or capsules for formaldehyde) into the dilution air sample collection systems for methanol and formaldehyde (may be omitted for 1990 through 1994 model years).

(5) Start the CVS (if not already on), the sample pumps (except the diesel particulate sample pump, if applica-

ble), the temperature recorder, the vehicle cooling fan, and the heated hydrocarbon analysis recorder (diesels only). (The heat exchanger of the constant volume sampler, if used, petroleum-fueled diesel hydrocarbon analyzer continuous sample line and filter, methanol-fueled vehicle hydrocarbon, methanol and formaldehyde sample lines, if applicable, should be preheated to their respective operating temperatures before the test begins.)

(6) Adjust the sample flow rates to the desired flow rate and set the gas flow measuring devices to zero.

(i) For gaseous bag samples (except hydrocarbon samples), the minimum flow rate is 0.17 cfm (0.08 1/sec).

(ii) For hydrocarbon samples, the minimum FID (or HFID in the case of diesel- and methanol-fueled Otto-cycle vehicles) flow rate is 0.066 cfm (0.031 1/sec).

(iii) For methanol samples, the minimum flow rate is 0.14 cfm (0.067 1/sec).

(iv) For formaldehyde samples, the minimum flow rate is 0.036 cfm (0.017 l/s) with capsule collector and 0.14 cfm (0.067 l/s) with impinger.

NOTE: CFV sample flow rate is fixed by the venturi design.

(7) Attach the exhaust tube to the vehicle tailpipe(s).

(8) Carefully install a particulate sample filter into each of the filter holders for diesel vehicle tests. The filters must be handled only with forceps or tongs. Rough or abrasive filter handling will result in erroneous weight determination.

(9) Start the gas flow measuring device, position the sample selector valves to direct the sample flow into the "transient" exhaust sample bag, the "transient" methanol exhaust sample, the "transient" formaldehyde exhaust sample, the "transient" dilution air sample bag, the "transient" methanol dilution air sample and the "transient" formaldehyde dilution air sample (turn on the petroleum-fueled diesel hydrocarbon analyzer system integrator, mark the recorder chart, start particulate sample pump No. 1, and record both gas meter or flow measurement instrument readings, if applicable), turn the key on, and start cranking the engine.

(10) Fifteen seconds after the engine starts, place the transmission in gear.

(11) Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule.

(12) Operate the vehicle according to the Urban Dynamometer Driving Schedule (§ 86.115).

NOTE: During diesel vehicle testing, adjust the flow rate through the particulate sample probe to maintain a constant value within ±5 percent of the set flow rate. Record the average temperature and pressure at the gas meter or flow instrument inlet. If the set flow rate cannot be maintained because of high particulate loading on the filter, the test shall be terminated. The test shall be rerun using a lower flow rate, or larger diameter filter, or both.

(13) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously switch the sample flows from the "transient" bags and samples to the "stabilized" bags and samples, switch off gas flow measuring device No. 1, switch off the No. 1 petroleum-fueled diesel hydrocarbon integrator and the No. 1 particulate sample pump, mark the petroleum-fueled diesel hydrocarbon recorder chart, and close valves isolating particulate filter No. 1, if applicable, and start gas flow measuring device No. 2 and start the petroleum-fueled diesel hydrocarbon integrator No. 2 and the No. 2 particulate sample pump and open valves isolating particulate filter No. 2, if applicable. Before the acceleration which is scheduled to occur at 510 seconds, record the measured roll or shaft revolutions and reset the counter or switch to a second counter. As soon as possible transfer the "transient" exhaust and dilution air samples to the analytical system and process the samples according to § 86.140 obtaining a stabilized reading of the bag exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test. Obtain methanol and formaldehyde sample analyses, if applicable, within 24 hours of the end of the sample collection phase of the test.

(14) Turn the engine off 2 seconds after the end of the last deceleration (at 1,369 seconds).

(15) Five seconds after the engine stops running, simultaneously turn off gas flow measuring device No. 2 and if applicable, turn off the petroleum-fueled diesel hydrocarbon integrator No. 2, mark the hydrocarbon recorder chart, turn off the No. 2 particulate sample pump and close the valves isolating particulate filter No. 2, and position the sample selector valves to the "standby" position (and open the valves isolating particulate filter No. 1, if applicable). Record the measured roll or shaft revolutions (both gas meter or flow measurement instrumentation readings), and re-set the counter. As soon as possible, transfer the "stabilized" exhaust and dilution air samples to the analytical system and process the samples according to § 86.140, obtaining a stabilized reading of the exhaust bag sample on all analyzers within 20 minutes of the end of the sample collection phase of the test. Obtain methanol and formaldehyde sample analyses, if applicable, within 24 hours of the end of the sample period. If applicable, carefully remove both pairs of particulate sample filters from their respective holders, and place each in a separate petri dish, and cover.

(16) Immediately after the end of the sample period, turn off the cooling fan and close the engine compartment cover.

(17) Turn off the CVS or disconnect the exhaust tube from the tailpipe(s) of the vehicle.

(18) Repeat the steps in paragraphs (b)(2) through (b)(2) of this section for the hot start test, except only two evacuated sample bags, two methanol sample impingers, two formaldehyde sample impingers, and one pair of particulate sample filters, as appropriate, are required. The step in paragraph (b)(9) of this section shall begin between 9 and 11 minutes after the end of the sample period for the cold start test.

(19) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously turn off gas flow measuring device No. 1 (and the petroleum-fueled diesel hydrocarbon integrator No. 1, mark the petroleum-fueled diesel hydrocarbon recorder chart and turn off the No. 1 particulate sample pump, if applicable) and position the sample selector valve to the "standby" position. (Engine shutdown is not part of the hot start test sample period.) Record the measured roll or shaft revolutions (and the No. 1 gas meter reading or flow measurement instrument). (Carefully remove the third pair of particulate sample filters from its holder and place in a clean petri dish and cover, if applicable.)

(20) As soon as possible, transfer the hot start "transient" exhaust and dilution air bag samples to the analytical system and process the samples according to § 86.140 obtaining a stabilized reading of the bag exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test. Obtain methanol and formaldehyde sample analyses, if applicable, within 24 hours of the end of the sample period (if it is not possible to perform analysis on the methanol and formaldehyde samples, within 24 hours, the samples should be stored in a dark cold (~0 °C) environment until analysis).

(21) As soon as possible, and in no case longer than one hour after the end of the hot start phase of the test, transfer the six particulate filters to the weighing chamber for post-test conditioning, if applicable.

(22) Disconnect the exhaust tube from the vehicle tailpipe(s) and drive the vehicle from dynamometer.

(23) The CVS or CFV may be turned off, if desired.

(24) Vehicles to be tested for evaporative emissions will proceed according to § 86.138. For all others this completes the test sequence.

[54 FR 14530, Apr. 11, 1989]

§ 86.138-78 Hot-soak test.

The hot-soak evaporative emission test shall be conducted immediately following the hot transient exhaust emission test.

(a) Prior to the completion of the hot-start transient exhaust emission sampling period, the evaporative emission enclosure shall be purged for several minutes.

(b) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(c) If not already on, the evaporative enclosure mixing fan shall be turned on at this time.

(d) Upon completion of the hot transient exhaust emission sampling period, the vehicle engine compartment cover shall be closed, the cooling fan shall be moved, the vehicle shall be disconnected from the dynamometer and exhaust sampling system, and then driven at minimum throttle to the vehicle entrance of the enclosure.

(e) The vehicle's engine must be stopped before any part of the vehicle enters the enclosure. The vehicle may be pushed or coasted into the enclosure.

(f) The test vehicle windows and luggage compartments shall be opened, if not already open.

(g) The temperature recording system shall be started and the time of engine shut off shall be noted on the evaporative emission hydrocarbon data recording system.

(h) The enclosure doors shall be closed and sealed within two minutes of engine shutdown and within seven minutes after the end of the exhaust test.

(i) The 60±0.5 minute hot soak begins when the enclosure doors are sealed. The enclosure atmosphere shall be analyzed and recorded. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCi}, for use in calculating evaporative losses, see § 86.143.

(j) The test vehicle shall be permitted to soak for a period of one hour in the enclosure.

(k) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the test.

(l) At the end of the 60±0.5 minute test period, again analyze the enclosure atmosphere and record time. This is the final (time=60 minutes) hydrocarbon concentration, C_{HCi}, for use in calculating evaporative losses, see § 86.143. This operation completes the evaporative emission measurement procedure.

§ 86.138-90 Hot-soak test.

The hot-soak evaporative emission test shall be conducted immediately following the hot transient exhaust emission test.

(a) Prior to the completion of the hot-start transient exhaust emission sampling period, the evaporative emission enclosure shall be purged for several minutes.

(b) The FID (or HFID) hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(c) Fresh impingers shall be installed in the methanol sample collection system immediately prior to the start of the test, if applicable.

(d) If not already on, the evaporative enclosure mixing fan shall be turned on at this time.

(e) Upon completion of the hot transient exhaust emission sampling period, the vehicle engine compartment cover shall be closed, the cooling fan shall be moved, the vehicle shall be disconnected from the dynamometer and exhaust sampling system, and then driven at minimum throttle to the vehicle entrance of the enclosure.

(f) The vehicle's engine must be stopped before any part of the vehicle enters the enclosure. The vehicle may be pushed or coasted into the enclosure.

(g) The test vehicle windows and luggage compartments shall be opened, if not already open.

(h) The temperature recording system shall be started and the time of engine shut off shall be noted on the evaporative emission hydrocarbon recording system.

(i) The enclosure doors shall be closed and sealed within two minutes of engine shutdown and within seven minutes after the end of the exhaust test.

(j) The 60±0.5 minute hot soak begins when the enclosure doors are sealed. The enclosure atmosphere shall be analyzed for hydrocarbon and recorded. This is initial (time=0 minutes) hydrocarbon concentration, C_{HCi}, for use in calculating evaporative losses, see § 86.143. The "zero" time methanol sample shall be collected starting at the same time as the hydrocarbon analysis is started. Sampling should continue for four minutes.

(k) The test vehicle shall be permitted to soak for a period of one hour in the enclosure.

(l) The FID (or HFID) hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the test.

(m) Fresh impingers shall be installed in the methanol collection system immediately prior to the end of the test, if applicable.

(n) At the end of the 60±0.5 minute test period, again analyze the enclosure atmosphere for hydrocarbons and methanol, as described in § 86.138-90(j), and record time. These analyses provide the final (time=60 minutes) hydrocarbon concentration, C_{HCf}, and the final methanol level for use in calculating evaporative losses, see § 86.143. This operation completes the evaporative emission measurement procedure.

(o) *Alternate method for methanol sampling.* Since sample times of longer than four minutes may be necessary in order to collect an adequate and representative sample of methanol at the end of a test (when SHED concentrations are usually increasing rapidly), it may be necessary to rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flowing through the impingers should be minimized in order to prevent any losses. This alternative must be adopted if the four minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis.

[54 FR 14532, Apr. 11, 1989]

§ 86.139-82 Diesel particulate filter handling and weighing.

(a) At least 8 hours, but not more than 56 hours before the test, place each filter in an open, but protected, petri dish and place in the weighing chamber which meets the humidity and temperature specifications of § 86.112.

(b) At the end of the 8 to 56 hour stabilization period, weigh the filter on a balance having a precision of one microgram. Record this weight. This reading is the tare weight.

(c) The filter shall then be stored in a covered petri dish which shall remain in the weighing chamber until needed for testing.

(d)(1) If the filter is not used within one hour of its removal from the weighing chamber, it shall be reweighed.

(2) The one hour limit may be replaced by an eight-hour limit if one or both of the following conditions are met:

(i) A stabilized filter is placed and kept in a sealed filter holder assembly with the ends plugged, or

(ii) A stabilized filter is placed in a sealed filter holder assembly, which is then immediately placed in a sample line through which there is no flow.

(e) After the test, and after the sample filter is returned to the weighing room, condition it for at least 1 hour but not more than 56 hours. Then weigh a second time. This latter reading is the gross weight of the filter. Record this weight.

(f) The net weight (Pe) is the gross weight minus the tare weight.

NOTE: Should the sample on the filter contact the petri dish or any other surface, the test is void and must be rerun.

[45 FR 14519, Mar. 5, 1980, as amended at 52 FR 47869, Dec. 16, 1987]

§ 86.139-90 Particulate filter handling and weighing.

(a) At least 8 hours, but not more than 56 hours before the test, place each filter in an open, but protected, petri dish and place in the weighing chamber which meets the humidity and temperature specifications of § 86.112.

(b) At the end of the 8 to 56 hour stabilization period, weigh the filter on a balance having a precision of one microgram. Record this weight. This reading is the tare weight.

(c) The filter shall then be stored in a covered petri dish which shall remain in the weighing chamber until needed for testing.

(d)(1) If the filter is not used within one hour of its removal from the weighing chamber, it shall be reweighed.

(2) The one hour limit may be replaced by an eight-hour limit if one or both of the following conditions are met:

(i) A stabilized filter is placed and kept in a sealed filter holder assembly with the ends plugged, or

(ii) A stabilized filter is placed in a sealed filter holder assembly, which is then immediately placed in a sample line through which there is no flow.

(e) After the test, and after the sample filter is returned to the weighing room, condition it for at least 1 hour but not more than 56 hours. Then weigh a second time. This latter reading is the gross weight of the filter. Record this weight.

(f) The net weight (P_e) is the gross weight minus the tare weight.

NOTE: Should the sample on the filter contact the petri dish or any other surface, the test is void and must be rerun.

[54 FR 14532, Apr. 11, 1989]

§ 86.140-82 Exhaust sample analysis.

The following sequence of operations shall be performed in conjunction with each series of measurement Y:

(a) For CO, CO_2, NO_x and gasoline HC:

(1) Zero the analyzers and obtain a stable zero reading. Recheck after tests.

(2) Introduce span gases and set instrument gains. In order to avoid errors, span and calibrate at the same flow rates used to analyze the test sample. Span gases should have concentrations equal to 75 to 100 percent of full scale. If gain has shifted significantly on the analyzers, check the calibrations. Show actual concentrations on chart.

(3) Check zeros; repeat the procedure in paragraphs (a) (1) and (2) of this section if required.

(4) Check flow rates and pressures.

(5) Measure HC, CO, CO_2 and NO_x concentrations of samples.

(6) Check zero and span points. If difference is greater than 2 percent of full scale, repeat the procedure in paragraphs (a) (1) through (5) of this section.

(b) For diesel HC:

(1) Zero HFID analyzer and obtain a stable zero reading.

(2) Introduce span gas and set instrument gains. Span gas should have concentration equal to 75 to 100 percent of full scale.

(3) Check zero as in paragraph (b)(1) of this section.

(4) Introduction of zero and span gas into the analyzer can be accomplished by either of the following methods:

(i) Close heated valve in HC sample (see Figures B82-3 or B82-4), and allow gases to enter HFID. Extreme care should be taken not to introduce gases under high pressure.

(ii) Connect zero and span line directly to HC sample probe and introduce gases at a flow rate greater than 125 percent of the HFID flow rate with the CVS blower operating (see figures B82-3A or B82-4A). Excess flow must be allowed to exit probe inlet.

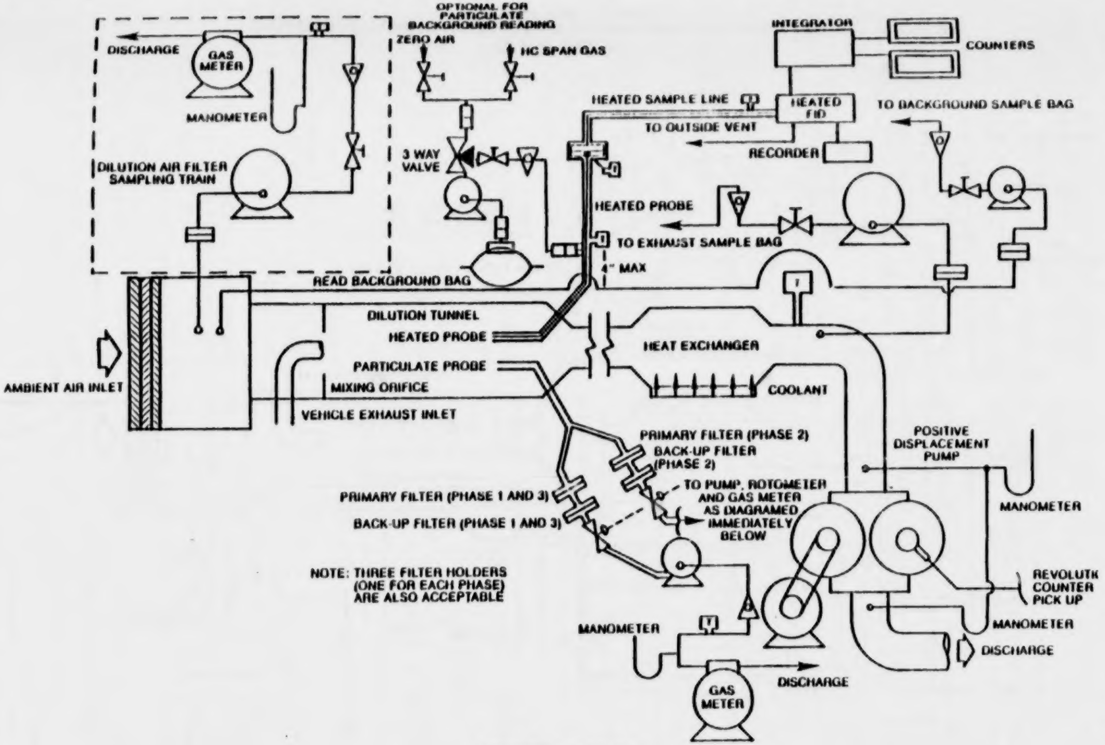

OPTIONAL FOR PARTICULATE BACKGROUND READING
ZERO AIR
HC SPAN GAS
INTEGRATOR
COUNTERS
DISCHARGE
GAS METER
MANOMETER
DILUTION AIR FILTER SAMPLING TRAIN
3 WAY VALVE
HEATED SAMPLE LINE
HEATED FID
TO BACKGROUND SAMPLE BAG
TO OUTSIDE VENT
RECORDER
HEATED PROBE
TO EXHAUST SAMPLE BAG
4" MAX
READ BACKGROUND BAG
DILUTION TUNNEL
HEATED PROBE
HEAT EXCHANGER
PARTICULATE PROBE
AMBIENT AIR INLET
MIXING ORIFICE
COOLANT
VEHICLE EXHAUST INLET
PRIMARY FILTER (PHASE 2)
BACK-UP FILTER (PHASE 2)
POSITIVE DISPLACEMENT PUMP
TO PUMP, ROTOMETER AND GAS METER AS DIAGRAMED IMMEDIATELY BELOW
PRIMARY FILTER (PHASE 1 AND 3)
BACK-UP FILTER (PHASE 1 AND 3)
MANOMETER
NOTE: THREE FILTER HOLDERS (ONE FOR EACH PHASE) ARE ALSO ACCEPTABLE
REVOLUTK COUNTER PICK UP
MANOMETER
MANOMETER
DISCHARGE
DISCHARGE
GAS METER

FIGURE B82-3A
GASEOUS AND PARTICULATE EMISSIONS SAMPLING SYSTEM (PDP-CVS)
(FOR DIESEL VEHICLES ONLY)

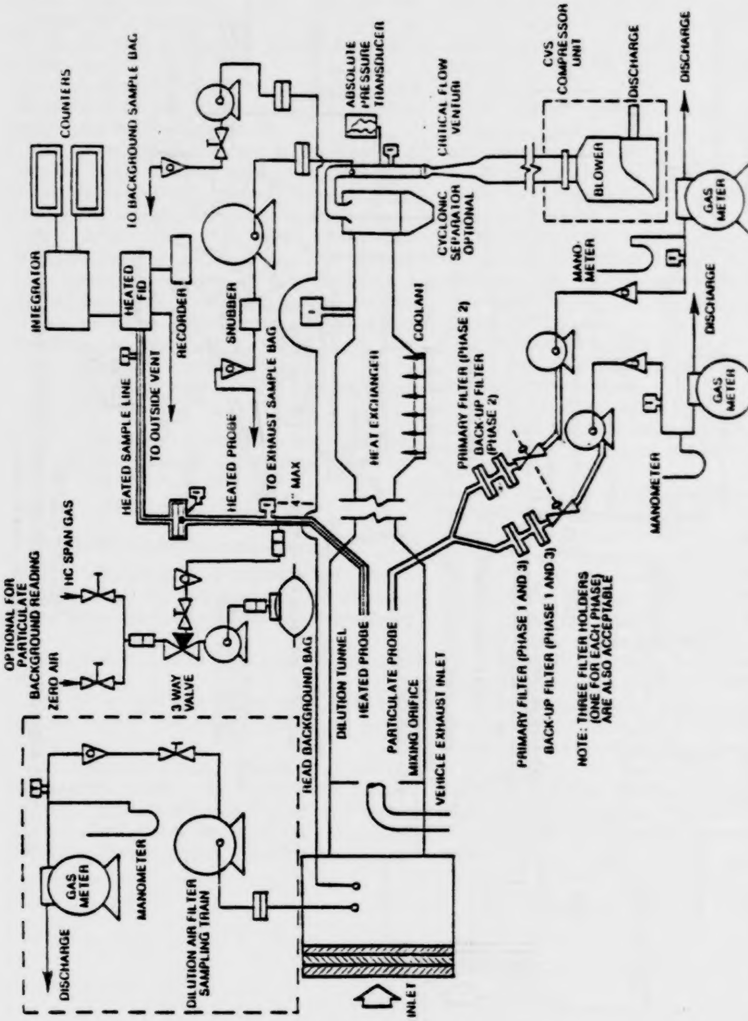

COUNTERS
INTEGRATOR
HEATED FID
RECORDER
TO BACKGROUND SAMPLE BAG
SNUBBER
HEATED SAMPLE LINE
TO OUTSIDE VENT
HEATED PROBE
TO EXHAUST SAMPLE BAG
4" MAX
ABSOLUTE PRESSURE TRANSDUCER
CRITICAL FLOW VENTURI
CYCLONIC SEPARATOR OPTIONAL
HEAT EXCHANGER
COOLANT
CVS COMPRESSOR UNIT
BLOWER
DISCHARGE
DISCHARGE
GAS METER
MANO-METER
DISCHARGE
GAS METER
MANOMETER
PRIMARY FILTER (PHASE 2)
BACK-UP FILTER (PHASE 2)
PRIMARY FILTER (PHASE 1 AND 3)
BACK-UP FILTER (PHASE 1 AND 3)
NOTE: THREE FILTER HOLDERS (ONE FOR EACH PHASE) ARE ALSO ACCEPTABLE
OPTIONAL FOR PARTICULATE BACKGROUND READING
HC SPAN GAS
ZERO AIR
3 WAY VALVE
READ BACKGROUND BAG
DILUTION TUNNEL
HEATED PROBE
PARTICULATE PROBE
MIXING ORIFICE
VEHICLE EXHAUST INLET
DISCHARGE
GAS METER
MANOMETER
DILUTION AIR FILTER SAMPLING TRAIN
AMBIENT AIR INLET

FIGURE B82-4A
GASEOUS AND PARTICULATE EMISSIONS SAMPLING SYSTEM (CFV-CVS)
(FOR DIESEL VEHICLES ONLY)

NOTE: In order to minimize errors, HFID flow rate and pressure during zero and span (and background bag reading) must be exactly the same as that used during testing.

(5) Continuously record (integrate electronically if desired) dilute hydrocarbon emissions levels during test. Background samples are collected in sample bags and analyzed as in paragraph (4)(i) or (4)(ii) of this section.

(6) Check zero and span as in paragraph (b)(1) through (b)(4)(i) or (4)(ii) of this section. If difference is greater than 2 percent of full scale, void test and check for HC "hangup" or electronic drift in analyzer.

[45 FR 14520, Mar. 5, 1980, as amended at 54 FR 2122, Jan. 19, 1989]

§ 86.140-90 Exhaust sample analysis.

The following sequence of operations shall be performed in conjunction with each series of measurements:

(a) For CO, CO_2, NOx, and for Otto-cycle and methanol-fueled diesel vehicle HC:

(1) Zero the analyzers and obtain a stable zero reading. Recheck after tests.

(2) Introduce span gases and set instrument gains. In order to avoid errors, span and calibrate at the same flow rates used to analyze the test sample. Span gases should have concentrations equal to 75 to 100 percent of full scale. If gain has shifted significantly on the analyzers, check the calibrations. Show actual concentrations on chart.

(3) Check zeroes; repeat the procedure in paragraphs (1) and (2) of this section if required.

(4) Check flow rates and pressures.

(5) Measure HC, CO, CO_2, and NOx concentrations of samples.

(6) Check zero and span points. If difference is greater than 2 percent of full scale, repeat the procedure in paragraphs (a) (1) through (5) of this section.

(b) For petroleum-fueled diesel vehicle HC:

(1) Zero HFID analyzer and obtain a stable zero reading.

(2) Introduce span gas and set instrument gains. Span gas should have concentration equal to 75 to 100 percent of full scale.

(3) Check zero as in (b)(1) of this section.

(4) Introduction of zero and span gas into the analyzer can be accomplished by either of the following methods:

(i) Close heated valve in HC sample (see Figures B90-5 or B90-6), and allow gases to enter HFID. Extreme care should be taken not to introduce gases under high pressure.

(ii) Connect zero and span line directly to HC sample probe and introduce gases at a flow rate greater than 125 percent of the HFID flow rate with the CVS blower operating (see Figures B90-5 or B90-6). Excess flow must be allowed to exit probe inlet.

NOTE: In order to minimize errors, HFID flow rate and pressure during zero and span (and background bag reading) must be exactly the same as that used during testing.

(5) Continuously record (integrate electronically if desired) dilute hydrocarbon emissions levels during test. Background samples are collected in sample bags and analyzed as in paragraphs (b)(4) (i) or (ii) of this section.

(6) Check zero and span as in paragraphs (b)(1) through (b)(4) (i) or (ii) of this section. If difference is greater than 2 percent of full scale, void test and check for HC "hangup" or electronic drift in analyzer.

(c) For CH_30H (methanol-fueled vehicles):

(1) Introduce a reference sample of methanol (the concentration of methanol in deionized water is known and is C_{MR} in the calculations) into the gas chromatograph and measure the area of the response peak This reference sample peak area is A_{MR} in the calculations.

(2) Introduce test samples into the gas chromatograph and measure the area of the response peak. This peak area is A_{MS} in the calculations.

(d) *For HCHO (methanol-fueled vehicles):* (1) Introduce a reference sample of formaldehyde (the concentration of formaldehyde as a dinitrophenylhydrazine derivative in acetonitrile is known (C_{FR})) into the high pressure liquid chromatograph (HPLC) and measure the area of the response peak. This reference sample peak area is A_{FR} in the calculations.

(2) Introduce test samples into the high pressure liquid chromatograph and measure the area of the responses peak. This peak area is A_{rs} in the calculations.

[54 FR 14533, Apr. 11, 1989]

§ 86.142-82 Records required.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System or device tested (brief description).

(c) Date and time of day for each part of the test schedule.

(d) Instrument operated.

(e) Driver or operator.

(f) Vehicle: ID number, manufacturer, model year, standards, engine family, evaporative emissions family, basic engine description (including displacement, number of cylinders, turbocharger used, and catalyst usage), fuel system (including number of carburetors, number of carburetor barrels, fuel injection type and fuel tank(s) capacity and location), engine code, gross vehicle weight rating, inertia weight class, actual curb weight at zero miles, actual road load at 50 mph (80 kph), transmission configuration, rpm and drive wheel tire pressure, as applicable.

(g) Indicated road load power absorption at 50 mph (80 kph) and dynamometer serial number. As an alternative to recording the dynamometer serial number, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided the test cell records show the pertinent information.

(h) All pertinent instrument information such as tuning—gain—serial number—detector number—range. As an alternative a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(i) Recorder charts: Identify zero, span, exhaust gas, and dilution air sample traces.

(j) Test cell barometric pressure, ambient temperature, and humidity.

NOTE: A central laboratory barometer may be used: *Provided*, That individual test cell barometric pressures are shown to be within ±0.1 percent of the barometric pressure the central barometer location.

(k) Fuel temperatures, as prescribe

(l) Pressure of the mixture of e haust and dilution air entering th CVS metering device (or pressure dro across the CFV), the pressure increas across the device, and the temperatur at the inlet. The temperature may b recorded continuously or digitally t determine temperature variations.

(m) The number of revolutions o the positive displacement pump accu mulated during each test phase whil exhaust samples are being collected The number of standard cubic fee metered by a critical flow ventur during each test phase would be th equivalent record for a CFV.

(n) The humidity of the dilution ai

NOTE: If conditioning columns are n used (see §§ 86.122 and 86.144) this measurement can be deleted. If the conditioning co umns are used and the dilution air is take from the test cell, the ambient humidity ca be used for this measurement.

(o) The temperature of the gas flow ing in the heated sample line befor the heated filter, and also before th HFID, and the temperature of th control system of the heated hydrocarbon detector (for diesel vehicle only).

(p) The driving distance for each o the three phases of the test, calculat ed from the measured roll or shaf revolutions.

(q) *Additional required records for diesel vehicles.* (1) Pressure and temperature of the dilute exhaust mixtur (and background air if sampled) at th inlet to the gas meter used for particulate sampling.

(2) The temperature of the dilute exhaust mixture inside the dilutio tunnel near the inlet of the particulate probe.

(3) Gas meter or flow measuremen instrumentation readings at the star of each sample period and at the end of each sample period.

(4) The stabilized pre-test weigh and post-test weight of each particulate sample and back-up filter.

(5) Continuous temperature and humidity recording of the ambient air i which the particulate filters were stabilized.

[45 FR 14523, Mar. 5, 1980]

§ 86.142-90 Records required.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System or device tested (brief description).

(c) Date and time of day for each part of the test schedule.

(d) Instrument operated.

(e) Driver or operator.

(f) Vehicle: ID number, manufacturer, model year, standards, engine family, evaporative emissions family, basic engine description (including displacement, number of cylinders, turbocharger used, and catalyst usage), fuel system (including number of carburetors, number of carburetor barrels, fuel injection type and fuel tank(s) capacity and location), engine code, gross vehicle weight rating, inertia weight class, actual curb weight at zero miles, actual road load at 50 mph (80 kph), transmission configuration, axle ratio, car line, system miles, idle rpm, and drive wheel tire pressure, as applicable.

(g) Indicated road load power absorption at 50 mph (80 kph) and dynamometer serial number. As an alternative to recording the dynamometer serial number, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided the test cell records show the pertinent information.

(h) All pertinent instrument information such as tuning—gain—serial number—detector number—range. As an alternative a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(i) Recorder charts: Identify zero, span, exhaust gas, and dilution air sample traces.

(j) Test cell barometric pressure, ambient temperature, and humidity.

NOTE: A central laboratory barometer may be used: *Provided*, that individual test cell barometric pressures are shown to be within ±0.1 percent of the barometric pressure at the central barometer location.

(k) Fuel temperatures, as prescribed.

(l) Pressure of the mixture of exhaust and dilution air entering the CVS metering device (or pressure drop across the CFV), the pressure increase across the device, and the temperature at the inlet. The temperature may be recorded continuously or digitally to determine temperature variations.

(m) The number of revolutions of the positive displacement pump accumulated during each test phase while exhaust samples are being collected. The number of standard cubic feet metered by a critical flow venturi during each test phase would be the equivalent record for a CFV.

(n) The humidity of the dilution air.

NOTE: If conditioning columns are not used (see §§ 86.122 and 86.144) this measurement can be deleted. If the conditioning columns are used and the dilution air is taken from the test cell, the ambient humidity can be used for this measurement.

(o) The temperature of the gas flowing in the heated sample line before the heated filter, and also before the HFID, and the temperature of the control system of the heated hydrocarbon detector (for petroleum-fueled diesel vehicles only).

(p) The driving distance for each of the three phases of the test, calculated from the measured roll or shaft revolutions.

(q) *Additional required records for petroleum-fueled and methanol-fueled diesel vehicles.* (1) Pressure and temperature of the dilute exhaust mixture (and background air if sampled) at the inlet to the gas meter used for particulate sampling.

(2) The temperature of the dilute exhaust mixture inside the dilution tunnel near the inlet of the particulate probe.

(3) Gas meter or flow measurement instrumentation readings at the start of each sample period and at the end of each sample period.

(4) The stabilized pre-test weight and post-test weight of each particulate sample and back-up filter.

(5) Continuous temperature and humidity recording of the ambient air in which the particulate filters were stabilized.

(r) *Additional required records for methanol-fueled vehicles.* (1) Specification of the methanol-fuel used during the test.

(2) Volume of sample passed through the methanol sampling system and the volume of deionized water in each impinger.

(3) The methanol concentration in the reference sample and the peak area from the GC analysis of the reference sample.

(4) The peak area of the GC analyses of the test samples (methanol).

(5) Volume of sample passed through the formaldehyde sampling system.

(6) The formaldehyde concentration in the reference sample and the peak area from the HPLC analysis of the reference sample.

(7) The peak area of the HPLC analysis of the test sample (formaldehyde).

(8) The temperature of the sample lines before the HFID and the impingers, and the temperature of the control system of the heated hydrocarbon detector.

[54 FR 14533, Apr. 11, 1989]

§ 86.143-78 Calculations; evaporative emissions.

The calculation of the net hydrocarbon mass change in the enclosure is used to determine the diurnal and hot soak mass emissions. The mass is calculated from initial and final hydrocarbon concentrations in ppm carbon, initial and final enclosure ambient temperatures, initial and final barometric pressures, and net enclosure volume using the following equation:

$$M_{HC}=kV_n\times 10^{-4}\left[\frac{C_{HCf}P_{Bf}}{T_f}-\frac{C_{HCi}P_{Bi}}{T_i}\right]$$

where:

M_{HC}=hydrocarbon mass, g.

C_{HC}=hydrocarbon concentration as ppm carbon.

V_n=net enclosure volume, ft^3 (m^3) as determined by subtracting 50 ft^3 (1.42 m^3) (volume of vehicle with trunk and windows open) from the enclosure volume. A manufacturer may use the measured volume of the vehicle (instead of the nominal 50 ft^3) with advance approval by the Administrator: *Provided*, The measured volume is determined and used for all vehicles tested by that manufacturer.

P_B=barometric pressure, in. Hg (kPa).

T=enclosure ambient temperature, R (K).

k=.208 (12+H/C)

for SI units,

$$k=1.2\,(12+H/C)$$

where:

H/C=Hydrogen-carbon ratio.

H/C=2.33 for diurnal emissions.

H/C=2.2 for hot soak emissions.

i=indicates initial reading.

f=indicates final reading.

The final reported results shall be computed by summing the individual evaporative emission results determined for the diurnal breathing-loss test, running-loss test, and the hot-soak test.

§ 86.143-90 Calculations; evaporative emissions.

(a) The calculation of the net hydrocarbon, methanol and hydrocarbon plus methanol (organic material hydrocarbon equivalent) mass change in the enclosure is used to determine the diurnal and hot soak mass emissions. The mass changes are calculated from initial and final hydrocarbon and methanol concentrations in ppm carbon, initial and final enclosure ambient temperatures, initial and final barometric pressures, and net enclosure volume using the following equations:

(1) For methanol:

$$M_{CH_3OH} = \left(\frac{V_n \times C_{MR}}{A_{MR}}\right) \times \left(\frac{T_{Ef}}{(V_{Ef} \times T_{SHEDf})} \times [(A_{MS1f} \times AV_{1f}) + (A_{MS2f} \times AV_{2f})] - \frac{T_{Ei}}{(V_{Ei} \times T_{SHEDi})} \times [(A_{MS1i} \times AV_{1i}) + (A_{MS2i} \times AV_{2i})]\right)$$

Where:

(i) M_{CH3OH}=Methanol mass change, µg.

(ii) V_n=Net enclosure volume, ft³, as determined by subtracting 50 ft³ (1.42 m³) (volume of vehicle with trunk and windows open) from the enclosure volume. A manufacturer may use the measured volume of the vehicle (instead of the nominal 50 ft³) with advance approval by the Administrator: *Provided*, the measured volume is determined and used for all vehicles tested by that manufacturer.

(iii) C_{MR}=Concentration of methanol in standard sample for calibration of GC, µg/ml.

(iv) A_{MR}=GC peak area of standard sample.

(v) T_E=Temperature of sample withdrawn, °R.

(vi) V_E=Volume of sample withdrawn, ft³.

(vii) T_{SHED}=Temperature of SHED, °R.

(viii) A_{MS}=GC peak area of sample.

(ix) AV=Volume of absorbing reagent in impinger.

(x) P_B=Barometric pressure at time of sampling, in. Hg.

(xi) i=Initial sample.

(xii) f=Final sample.

(xiii) 1=First impinger.

(xiv) 2=Second impinger.

(2) For hydrocarbons:

$$M_{HC} = (kV_n \times 10^{-4}) \left[\frac{(C_{HCf} - rC_{CH3OHf})P_{Bf}}{T_f} - \frac{(C_{HCi} - rC_{CH3OHi})P_{Bi}}{T_i}\right]$$

Where:

(i) M_{HC}=Hydrocarbon mass change, g.

(ii) C_{HC}=FID hydrocarbon concentration as ppm carbon including FID response to methanol in the sample.

(iii) C_{CH3OH}=Methanol concentration as ppm carbon.

$$= \left(\frac{1.501 \times 10^{-3} C_{MR} \times T}{A_{MR} \times P_B \times V_E}\right) \times [(A_{S1} \times AV_1) + (A_{S2} \times AV_2)]$$

(iv) V_n=Net enclosure volume ft^3 (m^3), as determined by subtracting 50 ft^3 (1.42 m^3) (volume of vehicle with trunk and windows open) from the enclosure volume. A manufacturer may use the measured volume of the vehicle (instead of the nominal 50 ft^3) with advance approval by the Administrator: *Provided*, the measured volume is determined and used for all vehicles tested by that manufacturer.

(v) r=FID response factor to methanol.

(vi) P_B=Barometric pressure, in Hg (kPa).

(vii) T=Enclosure temperature °R(°K).

(viii) i=initial reading.

(ix) f=final reading.

(x) 1=First impinger.

(xi) 2=Second impinger.

(xii)(A) k=0.208 (12+H/C).

(B) *For SI units*, k=1.2 (12+H/C).

Where:

(xiii) H/C=hydrogen-carbon ratio.

(A) H/C=2.33 for diurnal emissions.

(B) H/C=2.2 for hot soak emissions.

(3) For total evaporative emissions:

Total Evaporative Emissions=Total Diurnal Emissions+Total Hot Soak Emissions

$$=\left(M_{HC}+\frac{14.3594}{32.042}\times 10^{6}\,M_{CH3OH}\right)+\left(M_{HC}+\frac{14.2284}{32.042}\times 10^{6}M_{CH3OH}\right),\ g$$

(b) The final reported results shall be computed by summing the individual evaporative emission results determined for the diurnal breathing-loss test, running-loss test and the hot-soak test.

[54 FR 14534, Apr. 11, 1989]

§ 86.144-78 Calculations; exhaust emissions.

The final reported test results shall be computed by use of the following formula:

(a) For light duty vehicles and light duty trucks:

$Y_{wm}=0.43\ ((Y_{ct}+Y_s)/(D_{ct}+D_s))+0.57\ ((Y_{ht}+Y_s)/(D_{ht}+D_s))$

where:

Y_{wm}=Weighted mass emissions of each pollutant, i.e., HC, CO, NO_x or CO_2, in grams per vehicle mile.

Y_{ct}=Mass emissions as calculated from the "transient" phase of the cold start test, in grams per test phase.

Y_{ht}=Mass emissions as calculated from the "transient" phase of the hot start test, in grams per test phase.

Y_s=Mass emissions as calculated from the "stabilized" phase of the cold start test, in grams per test phase.

D_{ct}=The measured driving distance from the "transient" phase of the cold start test, in miles.

D_{ht}=The measured distance from the "transient" phase of the hot start test, in miles.

D_s=The measured driving distance from the "stabilized" phase of the cold start test, in miles.

(b) The mass of each pollutant for each phase of both the cold start test and the hot start test is determined from the following:

(1) Hydrocarbon mass:

$HC_{mass}=V_{mix}\times Density_{HC}\times (HC_{conc}/1{,}000{,}000)$

(2) Oxides of nitrogen mass:

$NOx_{mass}=V_{mix}\times Density_{NO2}\times K_H\times (NOx_{conc}/1{,}000{,}000)$

(3) Carbon monoxide mass:

$CO_{mass}=V_{mix}\times Density_{CO}\times (CO_{conc}/1{,}000{,}000)$

(4) Carbon dioxide mass:

$CO_{2mass}=V_{mix}\times Density_{CO2}\times (CO_{2conc}/100)$

(c) Meaning of symbols:

(1) HC_{mass}=Hydrocarbon emissions in grams per test phase.

$Density_{HC}$=Density of hydrocarbons is 16.33 g/ft^3 (0.5768 kg/m^3), assuming an average carbon to hydrogen ratio of 1:1.85 at 68° F (20° C) and 760 mm Hg (101.3 kPa) pressure.

HC_{conc}=Hydrocarbon concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent, i.e., equivalent propane×3.
$HC_{conc}=HC_e-HC_d(1-1/DF)$

where:

HC_e=Hydrocarbon concentration of the dilute exhaust sample or, for Diesel, average hydrocarbon concentration of the dilute exhaust sample as calculated from the integrated HC traces, in ppm carbon equivalent.

HC_d=Hydrocarbon concentration of the dilution air as measured, in ppm carbon equivalent.

(2) NOx_{mass}=Oxides of nitrogen emissions, in grams per test phase.

Density $_{NO_2}$=Density of oxides of nitrogen is 54.16 g/ft³ (1.913 kg/m³), assuming they are in the form of nitrogen dioxide, at 68° F (20° C) and 760 mm Hg (101.3 kPa) pressure.

NOx_{conc}=Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, in ppm.

$NOx_{conc}=NOx_e-NOx_d\ (1-1/DF)$

where:

NOx_e=Oxides of nitrogen concentration of the dilute exhaust sample as measured, in ppm.

NOx_d=Oxides of nitrogen concentration of the dilute air as measured, in ppm.

(3) CO_{mass}=Carbon monoxide emissions, in grams per test phase.

$Density_{co}$=Density of carbon monoxide is 32.97 g/ft³ (1.164 kg/m³), at 68°F (20°C) and 760 mm Hg (101.3 kPa) pressure.

CO_{conc}=Carbon monoxide concentration of the dilute exhaust sample corrected for background, water vapor, and CO_2 extraction, in ppm.

$CO_{conc}=CO_e-CO_d[1-(1/DF)]$

Where:

CO_e=Carbon monoxide concentration of the dilute exhaust volume corrected for water vapor and carbon dioxide extraction, in ppm. The calculation assumes the carbon to hydrogen ratio of the fuel is 1:1.85.

$CO_e(1-0.01925\ CO_{2e}-0.000323\ R)\ CO_{em}$

Where:

CO_{dm}=Carbon monoxide concentration of the dilution air sample as measured, in ppm.

NOTE: If a CO instrument which meets the criteria specified in § 86.111 is used and the conditioning column has been deleted, CO_{em} must be substituted directly for CO_e and CO_{dm} must be substituted directly for CO_d.

(4) CO_{2mass}=Carbon dioxide emissions, in grams per test phase.

$DensityCO_2$=Density of carbon dioxide is 51.81 g/ft³ (1.830 kg/m³), at 68° F (20° C) and 760 mm Hg (101.3 kPa) pressure.

CO_{2conc}=Carbon dioxide concentrations of the dilute exhaust sample corrected for background, in percent.

$CO_{2conc}=CO_{2e}-CO_{2d}\ (1-1/DF)$

where:

CO_{2d}=Carbon dioxide concentration of the dilution air as measured, in percent.

(5) $DF=13.4/[CO_{2e}+(HC_e+CO_e)10^{-4}]$

K_H=Humidity correction factor.
$K_H=1/[1-0.0047(H-75)]$
for SI units=$1/[1-0.0329(H-10.71)]$

where:

H=Absolute humidity in grains (grams) of water per pound (kilogram) of dry air.
$H=[(43.478)R_a\times P_d]/[P_B-(P_d\times R_a/100)]$
for SI units, $H=[(6.211)R_a\times P_d]/[P_b-(P_d\times R_a/100)]$

R_a=Relative humidity of the ambient air, in percent.

P_d=Saturated vapor pressure, in mm Hg (kPa) at the ambient dry bulb temperature.

P_B=Barometric pressure, in mm Hg (kPa).

V_{mix}=Total dilute exhaust volume in cubic feet per test phase corrected to standard conditions (528 R) (293 K) and 760 mm Hg (101.3 kPa)).

For PDP-CVS, V_{mix} is:

$V_{mix}=V_o\times N(P_B-P_4)\ 528\ R/(760\ \text{mm Hg})\ (T_p)$

for SI units,

$V_{mix}=V_o\times N(P_B-P_4)\ (293.15\ K)/(101.325\ \text{kPa})\ (T_p)$

where:

V_o=Volume of gas pumped by the positive displacement pump, in cubic feet (m³) per revolution. This volume is dependent on the pressure differential across the positive displacement pump.

N=Number of revolutions of the positive displacement pump during the test phase while samples are being collected.

P_B=Barometric pressure, in mm Hg (kPa).

P_4=Pressure depression below atmospheric measured at the inlet to the positive displacement pump, in mm Hg (kPa) (during an idle mode).

T_p=Average temperature of dilute exhaust entering positive displacement pump during test, R(K).

(d) Example calculation of mass values of exhaust emissions using positive displacement pump:

(1) For the "transient" phase of the cold start test assume the following:

V_o=0.29344 ft³/revolution; N=10,485; R=48.0 percent; R_a=48.2 percent; P_B=762 mm Hg; P_d=22.225 mm Hg; P_4=70 mm Hg; T_p=570 R; HC_e=105.8 ppm, carbon equivalent; NO_{xe}=11.2 ppm; CO_{em}=306.6 ppm; CL_{2e}=1.43 percent; HC_d=12.1 ppm; NO_{xd}=0.8 ppm; CO_{dm}=15.3 ppm.

CO_{2d}=0.032 %; D_{ct}=3.598 miles.

then:

V_{mix}=(0.29344) (10,485) (762-70) (528)/(760)(570)=2595.0 ft³ per test phase.

H=(43.478) (48.2) (22.225)/[762 (22.225×48.2/100)] = 62 grains of water per pound of dry air

K_H=1/[1−0.0047(62-75)]=0.9424

CO_e=[1−0.01925 (1.43)−0.000323 (48)] 306.0=293.4 ppm

CO_d=[1−0.000323 (48)] 15.3=15.1 ppm

DF=13.4/[1.43+(105.8+293.4)×10^{-4}]=9.116

HC_{conc}=105.8−12.1(1−1/9.116)=95.03 ppm.

HC_{mass}=(2595) (16.33) (95.03/1,000,000)=4.027 grams per test phase.

NOx_{conc}=11.2-0.8 (1-1/9.116)=10.49 ppm

NOx_{mass}=(2595) (54.16) (10.49/1,000,000) (0.9424)=1.389 grams per test phase.

CO_{conc}=293.4-15.1 (1-1/9.116)=280.0 ppm

CO_{mass}=(2595) (32.97) (280/1,000,000)=23.96 grams per test phase.

CO_{2conc}=1.43−.032 (1-1/9.116)=1.402%

CO_{2mass}=(2595.0) (51.85) (1.402/100) =1886 grams per test phase.

(2) For the stabilized portion of the cold start test assume that similar calculations resulted in the following:

HC_{mass}=0.62 grams per test phase

NOx_{mass}=1.27 grams per test phase

CO_{mass}=5.98 grams per test phase

CO_{2mass}=2346 grams per test phase.

D_s=3.902 miles.

(3) For the "transient" portion of the hot start test assume that similar calculations resulted in the following:

HC_{mass}=0.51 grams per test phase

NOx_{mass}=1.38 grams per test phase

CO_{mass}=5.01 grams per test phase

CO_{2mass}=1758 grams per test phase.

D_{ht}=3.598 miles.

(4) Weighted mass emission results:

HC_{wm}=0.43 [(4.027+0.62)/(3.598+3.902)]+0.57 [(0.51+0.62)/(3.598+3.902)]=0.352 grams per vehicle mile.

NO_{xwm}=0.43 [(1.389+1.27)/(3.598+3.902)]+ 0.57 [(1.38+1.27)/(3.598+3.902)]=.354 grams per vehicle mile.

CO_{wm}=0.43 [(23.96+5.98)/(3.598+3.902)]+ 0.57 [(5.01+5.98)/(3.598+3.902)]=2.5 grams per vehicle mile.

CO_{2wm}=0.43 [(1886+2346) (3.598+3.902)]+ 0.57 [(1758+2346) (3.598+3.902)]=555 grams per vehicle mile.

(Approved by the Office of Management and Budget under control number 2060-0390)

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[42 FR 32954, June 28, 1977, as amended at 42 FR 45655, Sept. 12, 1977; 43 FR 52922, Nov. 14, 1978; 49 FR 48138, Dec. 10, 1984; 50 FR 10694, Mar. 15, 1985]

§ 86.144-90 Calculations; exhaust emissions.

The final reported test results shall be computed by use of the following formula:

(a) For light-duty vehicles and light duty trucks:

$$Y_{wm}=0.43\left(\frac{Y_{ct}+Y_s}{D_{ct}+D_s}\right)+0.57\left(\frac{Y_{ht}+Y_s}{D_{ht}+D_s}\right)$$

Where:

(1) Y_{wm}=Weighted mass emissions of each

pollutant, *i.e.*, HC, CO, NOx or CO_2, in grams per vehicle mile and if appropriate, the weighted organic material hydrocarbon equivalent mass in grams per vehicle mile.

(2) Y_{ct}=Mass emissions as calculated from the "transient" phase of the cold start test, in grams per test phase.

(3) Y_{ht}=Mass emissions as calculated from the "transient" phase of the hot start test, in grams per test phase.

(4) Y_s=Mass emissions as calculated from the "stabilized" phase of the cold start test, in grams per test phase.

(5) D_{ct}=The measured driving distance from the "transient" phase of the cold start test, in miles.

(6) D_{ht}=The measured distance from the "transient" phase of the hot start test, in miles.

(7) D_s=The measured driving distance from the "stabilized" phase of the cold start test, in miles.

(b) The mass of each pollutant for each phase of both the cold start test and the hot start test is determined from the following:

(1) Hydrocarbon mass:

$HC_{mass} = V_{mix} \times Density_{HC} \times (HC_{conc}/1,000,000)$

(2) Oxides of nitrogen mass:

$NO_{xmass} = V_{mix} \times Density_{NO2} \times K_H \times (NO_{xconc}/1,000,000)$

(3) Carbon monoxide mass:

$CO_{mass} = V_{mix} \times Density_{CO} \times (CO_{conc}/1,000,000)$

(4) Carbon dioxide mass:

$CO_{2mass} = V_{mix} \times Density_{CO2} \times (CO_{2conc}/100)$

(5) Methanol mass:

$CH_3OH_{mass} = V_{mix} \times Density_{CH3OH} \times (CH_3OH_{conc}/1,000,000)$

(6) Formaldehyde mass:

$HCHO_{mass} = V_{mix} \times Density_{HCHO} \times (HCHO_{conc}/1,000,000)$

(7) Organic material hydrocarbon equivalent mass:

(i) OMHCE=

$$HC_{Mass} + \frac{13.8756}{32.042}(CH_3OH_{mass}) + \frac{13.8756}{30.0262}(HCHO_{mass})$$

(c) Meaning of symbols:

(1)(i) HC_{mass}=Hydrocarbon emissions, in grams per test phase.

(ii) $Density_{HC}$=Density of hydrocarbons is 16.33 g/ft^3 (0.5768 kg/m^3), assuming an average carbon to hydrogen ratio of 1:1.85, at 68°F (20°C) and 760 mm Hg (101.3 kPa) pressure.

(iii)(A) HC_{conc}=Hydrocarbon concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent, *i.e.*, equivalent propane×3.

(B) $HC_{conc} = HC_e - HC_d(1 - 1/DF)$.

Where:

(iv)(A) HC_e=Hydrocarbon concentration of the dilute exhaust sample or, for diesel (or methanol-fueled vehicles, if selected), average hydrocarbon concentration of the dilute exhaust sample as calculated from the integrated HC traces, in ppm carbon equivalent.

(B) HC_e = FID $HC_e - (r)C_{CH3OHe}$

(v) FID HC_e=Concentration of hydrocarbon plus methanol in dilute exhaust as measured by the FID, ppm carbon equivalent.

(vi) r=FID response to methanol.

(vii) C_{CH3OHe}=Concentration of methanol in dilute exhaust as determined from the dilute exhaust methanol sample in ppm carbon. For vehicles not fueled with methanol, C_{CH3OHe} equals zero.

(viii)(A) HC_d=Hydrocarbon concentration of the dilution air as measured, in ppm carbon equivalent.

(B) HC_e=FID $HC_d - (r)C_{CH3OHd}$

(ix) FID HC_d=Concentration of hydrocarbon plus methanol in dilution air as measured by the FID, ppm carbon equivalent.

(x) C_{CH3OHd}=Concentration of methanol in dilution air as determined from dilution air methanol sample in ppm carbon. For vehicles not fueled with methanol, C_{CH3OHd} equal zero.

(2)(i) NOx_{mass}=Oxides of nitrogen emissions, in grams per test phase.

(ii) $Density_{NO2}$=Density of oxides of nitrogen is 54.16 g/ft^3 (1.913 kg/m^3) assuming they are in the form of nitrogen dioxide, at 68°F (20°C) and 760 mm Hg (101.3kPa) pressure.

(iii)(A) NOx_{conc}=Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, in ppm.

(B) $NOx_{conc} = NOx_e - NOx_d(1 - (1/DF))$.

Where:

(iv) NOx_e=Oxides of nitrogen concentration of the dilute exhaust sample as measured, in ppm.

(v) NOx_d=Oxides of nitrogen concentration of the dilution air as measured, in ppm.

(3)(i) CO_{mass}=Carbon monoxide emissions, in grams per test phase.

(ii) $Density_{co}$=Density of carbon monoxide is 32.97 g/ft^3 (1.164 kg/m^3), at 68°F (20°C) and 760 mm Hg (101.3 kPa) pressure.

(iii)(A) CO_{conc}=Carbon monoxide concentration of the dilute exhaust sample corrected for background, water vapor, and CO_2 extraction, in ppm.

(B) $CO_{conc} = CO_e - CO_d(1 - (1/DF))$.

Where:

(iv)(A) CO_e = Carbon monoxide concentration of the dilute exhaust volume corrected for water vapor and carbon dioxide extraction, in ppm.

(B) $CO_e = (1 - 0.01925CO_{2e} - 0.000323R)CO_{em}$ for petroleum fuel with hydrogen to carbon ratio of 1.85:1.

(C) $CO_e = [1 - (0.01 + 0.005HCR)CO_{2e} - 0.000323R]CO_{em}$ for methanol fuel, where HCR is hydrogen-to-carbon ratio as measured for the fuel used.

(v) CO_{em} = Carbon monoxide concentration of the dilute exhaust sample as measured, in ppm.

(vi) CO_{2e} = Carbon dioxide concentration of the dilute exhaust sample, in percent.

(vii) R = Relative humidity of the dilution air, in percent (see § 86.142(n)).

(viii)(A) CO_d = Carbon monoxide concentration of the dilution air corrected for water vapor extraction, in ppm.

(B) $CO_d = (1 - 0.000323R)CO_{dm}$.

Where:

(ix) CO_{dm} = Carbon monoxide concentration of the dilution air sample as measured, in ppm.

NOTE: If a CO instrument which meets criteria specified in § 86.111 is used and conditioninq column has been deleted, CO must be substituted directly for CO, CO_{dm} must be substituted directly for CO,

(4)(i) CO_{2mass} = Carbon dioxide e sions, in grams per test phase.

(ii) Density CO_2 = Density of carb dioxide is 51.81 g/ft³ (1.830 kg/m³), 68°F (20°C) and 760 mm Hg (10 kPa) pressure.

(iii)(A) CO_{2conc} = Carbon dioxide co centration of the dilute exha sample corrected for background, percent.

(B) $CO_{2conc} = C0_{2e} - CO_{2d}(1 - (1/DF$

Where:

(iv) CO_{2d} = Carbon dioxide concentr tion of the dilution air as measured, percent.

(5)(i) CH_3OH_{mass} = Methanol em sions corrected for background, grams per test phase.

(ii) $Density_{CH3OH}$ = Density of meth nol is 37.71 g/ft³ (1.332 kg/m³), at 68 (20°C) and 760 mmHg (101.3kPa) pre sure.

(iii)(A) CH_3OH_{conc} = Methanol co centration of the dilute exhaust co rected for background, ppm.

(B) $CH_3OH_{conc} = C =_{CH3OHe} - C_{CH}$ $_{Hd}(1 - (1/DF))$

Where:

(iv)(A) C_{CH3OHe} = Methanol concentr tion in the dilute exhaust, ppm.

$$(B)\quad C_{CH3OHe} = \frac{3.813 \times 10^{-2} \times C_{CH3OHR} \times T_{EM}[(A_{S1} \times AV_{S1}) + (A_{S2} \times AV_{S2})]}{A_{CH3OHR} \times P_B \times V_{EM}}$$

(v)(A) C_{CH3OHd} = Methanol concentration in the dilution air, ppm.

$$(B)\quad C_{CH3OHd} = \frac{3.813 \times 10^{-2} \times C_{CH3OHR} \times T_{DM}[(A_{D1} \times AV_{D1}) + (A_{D2} \times AV_{D2})]}{A_{CH3OHR} \times P_B \times V_{DM}}$$

(vi) C_{CH3OHR} = Concentration of methanol in standard sample for calibration of GC, µg/ml.

(vii) A_{CH3OHR} = GC peak area of stan ard sample.

(viii) T_{EM}=Temperature of methanol sample withdrawn from dilute exhaust, °R.

(ix) T_{DM}=Temperature of methanol sample withdrawn from dilution air, °R.

(x) P_B=Barometric pressure during test, mm Hg.

(xi) V_{EM}=Volume of methanol sample withdrawn from dilute exhaust, ft³.

(xii) V_{DM}=Volume of methanol sample withdrawn from dilution air, ft³.

(xiii) A_S=GC peak area of sample drawn from dilute exhaust.

(xiv) A_D=GC peak area of sample drawn from dilution air.

(xv) AV_S=Volume of absorbing reagent (deionized water) in impinger through which methanol sample from dilute exhaust is drawn, ml.

(xvi) AV_D=Volume of absorbing reagent (deionized water) in impinger through which methanol sample from dilution air is drawn, ml.

(xvii) 1=first impinger.

(xviii) 2=second impinger.

(6)(i) $HCHO_{mass}$=Formaldehyde emissions corrected for background, in grams per test phase.

(ii) $Density_{HCHO}$=Density of formaldehyde is 35.36 g/ft³ (1.249 kg/m³), at 68 °F (20 °C) and 760 mmHg (101.3 kPa) pressure.

(iii)(A) $HCHO_{conc}$=Formaldehyde concentration of the dilute exhaust corrected for background, in ppm.

(B) $HCHO_{conc}=C_{HCHOe}-C_{HCHOd}\ (1-(1/DF))$

Where:

(iv)(A) C_{HCHOe}=Formaldehyde concentration in dilute exhaust, in ppm.

$$(B)\ C_{HCHOe} = \frac{4.069\times10^{-2}\times C_{FDE}\times V_{AE}\times Q\times T_{EF}}{V_{SE}\times P_B}$$

(v)(A) C_{HCHOd}=Formaldehyde concentration in dilution air in ppm.

$$(B)\ C_{HCHOd} = \frac{4.069\times10^{-2}\times C_{FDA}\times V_{AA}\times Q\times T_{DF}}{V_{SA}\times P_B}$$

(vi) C_{FDE}=Concentration of DNPH derivative of formaldehyde from dilute exhaust sample in sampling solution, µg/ml.

(vii) V_{AE}=Volume of sampling solution for dilute exhaust formaldehyde sample, ml.

(viii)(A) Q=Ratio of molecular weights of formaldehyde to its DNPH derivative.

(B) Q=0.1429.

(ix) T_{EF}=Temperature of formaldehyde sample withdrawn from dilute exhaust, °R.

(x) V_{SE}=Volume of formaldehyde sample withdrawn from dilute exhaust, ft³.

(xi) P_B=Barometric pressure during test, mm Hg.

(xii) C_{FDA}=Concentration of DNPH derivative of formaldehyde from dilution air sample in sampling solution, µg/ml.

(xiii) V_{AA}=Volume of sampling solution for dilution air formaldehyde sample, ml.

(xiv) T_{DF}=Temperature of formaldehyde sample withdrawn from dilution air, °R.

(xv) V_{SA}=Volume of formaldehyde sample withdrawn from dilution air, ft³.

(7)(i) $DF=13.4/[CO_{2e}+(HC_e+CO_e)\ 10^{-4}]$ for petroleum-fueled vehicles.

$$\text{(ii)}\quad DF = \frac{100 \times \left(\frac{x}{x + y/2 + 3.76(x + y/4 - z/2)}\right)}{CO_{2e} + (HC_e + CO_e + C_{CH3OH_e})\ 10^{-4}}$$

for methanol-fueled vehicles where fuel composition is $C_xH_yO_z$ as measured for the fuel used.

(iii)(A) K_H=Humidity correction factor.

(B) $K_H=1/[1-0.0047(H-75)]$.

(C) *For SI units,* $K_H=1/[1-0.0329(H-10.71)]$.

Where:

(iv)(A) H=Absolute humidity in grains (grams) of water per pound (kilogram) of dry air.

(B) $H=[(43.478)R_a \times P_d]/[P_B-(P_d \times R_a/100)]$.

(C) *For SI units,* $H=[(6.211)R_a \times P_d]/[P_B-(P_d \times R_a/100)]$.

(v) R_a=Relative humidity of the ambient air, percent.

(vi) P_d=Saturated vapor pressure, mm Hg (kPa) at the ambient dry bulb temperature.

(vii) P_B=Barometric pressure, mm Hg (kPa),

(viii)(A) V_{mix}=Total dilute exhaust volume in cubic feet per test phase corrected to standard conditions (528 °R (293 °K) and 760 mm Hg (101.3 kPa)).

(B) For PDP-CVS, V_{mix} is:

$$V_{mix} = \frac{V_O \times N \times (P_B - P_4) \times 528}{760 \times T_P}$$

(C) *For SI units,*

$$V_{mix} = \frac{V_O \times N \times (P_B - P_4) \times 293}{101.3 \times T_P}$$

Where:

(ix) V_o=Volume of gas pumped by the positive displacement pump, in cubic feet (m^3) per revolution. This volume is dependent on the pressure differential across the positive displacement pump.

(x) N=Number of revolutions of the positive displacement pump during the test phase while samples are being collected.

(xi) P_B=Barometric pressure, mm Hg (kPa).

(xii) P_4=Pressure depression below atmospheric measured at the inlet to the positive displacement pump, in mm Hg (kPa) (during an idle mode).

(xiii) T_p=Average temperature of dilute exhaust entering positive displacement pump during test, °R(°K).

(d) For petroleum-fueled vehicles, example calculation of mass values of exhaust emissions using positive displacement pump:

(1) For the "transient" phase of the cold start test assume the following:

V_o=0.29344 ft³/rev; N=10,485; R=48.0 pct; R_a=48.2 percent; P_B=762 mm Hg; P_d=22.225 mm Hg; P_4=70 mm Hg; T_p=570 °R; HC_e=105.8 ppm carbon equivalent; NO_{xe}=11.2 ppm; CO_{em}=306.6 ppm; CO_{2e}=1.43 percent; HC_d=12.1 ppm; NO_{xd}=0.8 ppm; CO_{dm}=15.3 ppm; CO_{2d}=0.032 percent; D_{ct}=3.598 miles.

Then:

(i) V_{mix}=(0.29344)(10,485)(762−70)(528)/(760)(570)=2595.0 ft³ per test phase.

$$\text{(ii) } H = \frac{(43.478)(48.2)(22.225)}{762-(22.225)(48.2/100)}$$

=62 grains of water per pound of dry air.

(iii) $K_H=1/[1-0.0047(62-75)]$ =0.9424

(iv) $CO_e=[1-0.01925(1.43)-0.000323(48)](306.6)$=293.4 ppm.

(v) $CO_d=[1-0.000323(48)](15.3)$=15.1 ppm.

(vi) DF=13.4/[1.43+10⁻⁴ 105.8+293.4)]=9.116.

(vii) HC_{conc}=105.8−12.1(1−1/9.116)=95.03 ppm.

(viii) HC_{mass}=(2595)(16.33)(95.03/1,000,000)=4.027 grams per test phase.

(ix) NOx_{conc}=11.2−0.8(1−1/9.116)=10.49 ppm.

(x) $NOx_{mass} = (2595)(54.16)(10.49/1{,}000{,}000)(0.9424) = 1.389$ grams per test phase.

(xi) $CO_{conc} = 293.4 - 15.1(1 - 1/9.116) = 280.0$ ppm.

(xii) $CO_{mass} = (2595)(32.97)(280/1{,}000{,}000) = 23.96$ grams per test phase.

(xiii) $CO_{2conc} = 1.43 - 0.032(1 - 1/9.116) = 1.402$ percent.

(xiv) $CO_{2mass} = (2595.0)(51.85)(1.402/100) = 1886$ grams per test phase.

(2) For the stabilized portion of the cold start test assume that similar calculations resulted in the following:

(i) $HC_{mass} = 0.62$ grams per test phase.

(ii) $NOx_{mass} = 1.27$ grams per test phase.

(iii) $CO_{mass} = 5.98$ grams per test phase.

(iv) $CO_{2mass} = 2346$ grams per test phase.

(v) $D_s = 3.902$ miles.

(3) For the "transient" portion of the hot start test assume that similar calculations resulted in the following:

(i) $HC_{mass} = 0.51$ gram per test phase.

(ii) $NOx_{mass} = 1.38$ grams per test phase.

(iii) $CO_{mass} = 5.01$ grams per test phase.

(iv) $CO_{2mass} = 1758$ grams per test phase.

(v) $D_{ht} = 3.598$ miles.

(4) Weighted mass emission results:

(i) $HC_{wm} = 0.43[(4.027 + 0.62)/(3.598 + 3.902)] + 0.57[(0.51 + 0.62)/(3.598 + 3.902)] = 0.352$ grams per vehicle mile.

(ii) $NO_{xwm} = 0.43[(1.389 + 1.27)/(3.598 + 3.902)] + 0.57[(1.38 + 1.27)/(3.598 + 3.902)] = 0.354$ grams per vehicle mile.

(iii) $CO_{wm} = 0.43[(23.96 + 5.98)/(3.598 + 3.902)] + 0.57[(5.01 + 5.98)/(3.598 + 3.902)] = 2.55$ grams per vehicle mile.

(iv) $CO_{2wm} = 0.43[(1886 + 2346)/(3.598 + 3.902) + 0.57[(1758 + 2346)/(3.598 + 3.902)] = 555$ grams per vehicle mile.

(e) For methanol-fueled vehicle with measured fuel composition of $CH_{3.14}O_{0.6}$ example calculation of exhaust emissions using positive displacement pump:

(1) For the "transient" phase of the cold start test assume the following:

$V_o = 0.29344$ ft³/rev; $N = 10{,}485$; $R = 48.0$ pct; $R_a = 48.2$ percent; $P_B = 762$ mm Hg; $P_d = 22.225$ mm Hg; $P_4 = 70$ mm Hg; T_p 570 °R; FID $HC_e = 81.6$ ppm, carbon equivalent; $r = 0.75$; $C_{CH3OHR} = 71$ ug/ml; $T_{EM} = 567$ °R; $A_{CH3OHR} = 3660$; V_{EM} 1.18 ft³; $A_{S1} = 4460$; $AV_{s1} = 25.2$ ml; $A_{s2} = 360$; $AV_{s2} = 24.9$ ml; $T_{DM} = 532$ °R; $V_{DM} = 1.17$ ft³; $A_{D1} = 110$; $AV_{D1} = 25.0$ ml; $A_{D2} = 10$; $AV_{D2} = 25.1$ ml; $C_{FDE} = 20$ ug/ml; $V_{AE} = 5.0$ ml; $Q = 0.1429$; $T_{EF} = 569$ °R; $V_{SE} = 0.30$ ft³; $C_{FDA} = 1$ ug/ml; $V_{AA} = 5.0$ ml; $T_{DF} = 532$ °R; $V_{SA} = 0.31$ ft³; $NOx_e = 11.2$ ppm; $CO_{em} = 306.6$ ppm; $CO_{2e} = 1.43$ pct; FID $HC_d = 12.1$ ppm; $NOx_d = 0.8$ ppm; $CO_{dm} = 15.3$ ppm; $CO_{2d} = 0.032$ percent; $D_{ct} = 3.598$ miles.

Then:

(i) $V_{mix} = (0.29344)(10{,}485)(762 - 70)(528)/(760)(570) = 2595.0$ ft³ per test phase.

(ii) $H = (43.478)(48.2)(22.225)/[762 - (22.225 \times 48.2/100)] = 62$ grains of water per pound of dry air.

(iii) $K_H = 1/[1 - 0.0047(62 - 75)] = 0.9424$.

(iv) $CO_e = [1 - (0.01 + 0.005 \times 3.14 \times 1.43) - 0.000323(48))] \times 306.6 = 291.9$ ppm.

(v) $CO_d = (1 - 0.000323(48)) \times 15.3 = 15.1$ ppm.

$$\text{(vi) } C_{CH3OHe} = \frac{(3.813 \times 10^{-2})(71)(567)[(4460)(25.2) + (360)(24.9)]}{(3660)(762)(1.18)} = 56.60 \text{ ppm.}$$

$$\text{(vii) } DF = \frac{100(1/[1 + (3.14/2) + 3.76(1 + (3.14/4) - (0.6/2))])}{1.43 + 10^{-4}[(81.6 + 291.9 + (1 - 0.75)(56.60))]} = 8.350$$

$$\text{(viii) } C_{CH3OHd} = \frac{(3.813\times10^{-2})\,(71)(532)[(110)(25.0)+(10)(25.1)]}{(3660)(762)(1.17)} = 1.32 \text{ ppm.}$$

(ix) $CH_3OH_{conc}=56.60-1.32(1-1/8.350)=55.44$ ppm.

(x) $CH_3OH_{mass}=2595.0\times37.71\times(55.44/1,000,000)=5.43$ grams per test phase.

(xi) $HC_{conc}=[81.6-(0.75)(56.60)]-[12.1-(0.75)(1.32)](1-1/8.530)=29.34$ ppm.

(xii) $HC_{mass}=(2594)(16.33)(29.34/1,000,000)=1.24$ grams per test phase.

$$\text{(xiii) } C_{HCHOe} = \frac{4.069\times10^{-2}(20)(5)(0.1429)(569)}{(0.30)(762)} = 1.4473 \text{ ppm.}$$

$$\text{(xiv) } C_{HCHOd} = \frac{4.069\times10^{-2}(1)(5)(0.1429)(532)}{(0.31)(762)} = 0.0655 \text{ ppm.}$$

(xv) $HCHO_{conc}=1.4473-0.0655(1-1/8.350)=1.3896$ ppm.

(xvi) $HCHO_{mass}=(2595)(35.36)(1.3896/1,000,000)=0.1275$ grams per test phase.

(xvii) $OMHCE=1.24+(13.8756/32.042)(5.43)+(13.8756/30.0262)(0.1275)=3.65$ grams per test phase.

(xviii) $NOx_{conc}=11.2-(0.8)(1-1/8.350)=10.50$ ppm

(xix) $NOx_{mass}=(2595)(54.16)(10.50/1,000,000)(0.9424)=1.390$ grams per test phase.

(xx) $CO_{conc}=291.9-15.1\ (1-1/8.350)=278.61$ ppm.

(xxi) $CO_{mass}=(2595.0)(32.97)(278.69/1,000,000)=23.84$ grams per test phase.

(xxii) $CO_{2conc}=1.43-0.032\ (1-1/8.350)=1.402$ percent

(xxiii) $CO_{2mass}=(2595.0)(51.85)(1.402/100)=1886$ grams per test phase.

(2) For the stabilized portion of the cold start test assume that similar calculations resulted in the following:

(i) $OMHCE=0.55$ grams per test phase.

(ii) $NOx_{mass}=1.27$ grams per test phase.

(iii) $CO_{mass}=5.98$ grams per test phase.

(iv) $CO_{2mass}=2346$ grams per test phase.

(v) $D_s=3.902$ miles.

(3) For the "transient" portion of the hot start test assume that similar calculations resulted in the following:

(i) $OMHCE=0.67$ grams as carbon equivalent per test phase.

(ii) $NOx_{mass}=1.38$ grams per test phase.

(iii) $CO_{mass}=5.01$ grams per test phase.

(iv) $CO_{2mass}=1758$ grams per test phase.

(v) $D_{ht}=3.598$ miles.

(4) Weighted emission results:

(i) $OMHCE_{wm}=0.43[(3.65+0.55)/(3.598+3.902)]+0.57[(0.67+0.55)/(3.598+3.902)]=0.334$ grams as carbon equivalent per mile.

(ii) $NOx_{wm}=0.43[(1.390+1.27)/(3.598+3.902)]+0.57[1.38+1.27)/(3.598+3.902)]=0.354$ grams per vehicle mile.

(iii) $CO_{wm}=0.43[(23.84+5.98)/(3.598+3.902)]+0.57[(5.01+5.98)/(3.598+3.902)]=2.54$ grams per vehicle mile.

(iv) $CO_{2wm}=0.43[(1836+2346)/(3.598+3.902)]+0.57[(1758+2346)/(3.598+3.902)]=555$ grams per vehicle mile.

[54 FR 14535, Apr. 11, 1989]

§ 86.145–82 Calculations; particulate emissions.

(a) The final reported test results for the mass particulate (M_p) in grams/mile shall be computed as follows.

$$M_p = 0.43(M_{p1} + M_{p2})/(D_{ct} + D_s) + 0.57(M_{p3} + M_{p2})/(D_{ht} + D_s)$$

where:

(1) M_{p1} = Mass of particulate determined from the "transient" phase of the cold start test, in grams per test phase. (See § 86.110-82(c)(1) for determination.)

(2) M_{p2} = Mass of particulate determined from the "stabilized" phase of the cold start test, in grams per test phase. (See § 86.110-82(c)(1) for determination.)

(3) M_{p3} = Mass of particulate determined from the "transient" phase of the hot start test, in grams per test phase. (See § 86.110-82(c)(1) for determination).

(4) D_{ct} = The measured driving distance from the "transient" phase of the cold start test, in miles.

(5) D_s = The measured driving distance from the "stabilized" phase of the cold start test, in miles.

(6) D_{ht} = The measured driving distance from the "transient" phase of the hot start test, in miles.

(b) The mass of particulate for each phase of testing is determined as follows:

$$M_{pj} = [V_{mixj} + V_{epj}] \times \left[\frac{P_{ej}}{V_{epj}} - \frac{P_b}{V_{bp}} (1 - 1/DF) \right]$$

where:

(1) j = 1, 2 or 3 depending on which phase the mass of particulate is being determined for (i.e., the "transient" phase of the cold start test, the "stabilized" phase of the cold start test, or the "transient" phase of the hot start test).

(2) V_{mix} = Total dilute exhaust volume in cubic meters per test, corrected to standard conditions 528°R (293°K) and 29.92 in Hg (101.3 kPa). V_{mix} is further defined in § 86.144.

(3) P_e=mass of particulate per test on the exhaust filter(s), grams.

(4) P_b = mass of particulate on the "background" filter, grams.

(i) The background particulate level, P_b, inside the dilution air filter box at EPA is very low. P_b will be assumed = 0, and background particulate samples will not be taken with each exhaust sample. It is recommended that background particulate checks be made periodically to verify the low level.

(ii) Any manufacturer may make the same assumption without prior EPA approval.

(iii) If P_b is assumed = 0, then no background correction is made. The equation for particulate mass emissions then reduces to:

$$M_{p_j} = \frac{[V_{mix_j} + V_{ep_j}] \times P_{e_j}}{V_{ep_j}}$$

(6) V_{ep} = total volume of sample pulled through the filter, cubic feet at standard conditions.

$$V_{ep} = \frac{V_{ap} \times (P_{bar} + P_{ip}) \times 528}{T_{ip} \times 29.92}$$

where:

(i) V_{ap} = corrected (according to procedure specified in § 85.120) dilute exhaust sample volume, cubic feet.

(ii) P_{bar} = barometric pressure, in Hg.

(iii) P_{ip} = pressure elevation above ambient measured at the inlet to the dilute exhaust sample gas meter or flow instrument, in Hg. (For most gas meters with unrestricted discharge P_{ip} is negligible and can be assumed = 0.)

(iv) T_{ip} = average temperature of the dilute exhaust sample at the inlet to the gas meter or flow instrument, °R.

(7) V_{bp} = total volume of the background sample, cubic feet at standard conditions. (V_{bp} is not required if P_b is assumed = 0.) It is calculated using the following formula:

$$V_{bp} = \frac{V_{ab} \times (P_{bar} + P_{ib}) \times 528}{T_{ib} \times 29.92}$$

where:

(i) V_{ab} = corrected (according to procedure specified in § 85.120) background sample volume, cubic feet.

(ii) P_{bar} = barometric pressure, in. Hg.

(iii) P_{ib}=pressure elevation above ambient measured at the inlet to the background gas meter or flow instrument, in Hg. (For most gas meters with unrestricted discharge P_{ib} is negligible and can be assumed=0.)

(iv) T_{ib}=average temperature of the background sample at the inlet to the gas meter or flow instrument, °R.

(8) DF=dilution factor. (DF is not required if P_b is assumed=0.)

[45 FR 14523, Mar. 5, 1980, as amended at 46 FR 50494, Oct. 13, 1981, and 47 FR 49807, Nov. 2, 1982]

Subpart C—[Reserved]

Subpart D—Emission Regulations for New Gasoline-Fueled and Diesel Heavy-Duty Engines; Gaseous Exhaust Test Procedures

AUTHORITY: Secs. 202, 206, 207, 208, 301(a), Clean Air Act, as amended (42 U.S.C. 1857f-1, 1857f-5, 1857f-5a, 1857f-6, 1857g(a)).

SOURCE: 42 FR 45154, Sept. 8, 1977, unless otherwise noted.

§ 86.301-79 Scope; applicability.

This subpart contains gaseous emission test procedures for gasoline-fueled and Diesel heavy-duty engines. It applies to 1979 and later model years.

§ 86.302-79 Definitions.

The definitions in §§ 86.077-2, 86.078-2, and 86.079-2 apply to this subpart.

§ 86.303-79 Abbreviations.

The abbreviations in § 86.078-3 apply to this subpart.

§ 86.304-79 Section numbering; construction.

(a) The model year of initial applicability is indicated by the section number. The two digits following the hyphen designate the first model year for which a section is effective. A section remains effective until superseded.

Example: Section § 86.311-79 applies to the 1979 and subsequent model years until superseded. If a section' § 86.311-81 is promulgated it would take effect beginning with the 1981 model year; § 86.311-79 would apply to model years 1979 and 1980.

(b) A section reference without a model year suffix refers to the section applicable for the appropriate model year.

(c) Unless indicated, all provisions in this subpart apply to both gasoline-fueled and Diesel heavy-duty engines.

§ 86.305-79 Introduction; structure of subpart.

(a) This subpart describes the equipment required and the procedures to follow in order to perform exhaust emission tests on gasoline-fueled and Diesel heavy-duty engines. Subpart A sets forth the testing requirments and test intervals necessary to comply with EPA certification procedures.

(b) Four topics are addressed in this subpart. Sections 86.306 through 86.318 set forth specifications and equipment requirements; §§ 86.319 through 86.333 discuss calibration methods and frequency; test procedures and data requirements are listed (in approximately chronological order) in §§ 86.334 through 86.343; and calculation formulas are found in §§ 86.344 and 86.345. Alternative procedures and calculations are set forth in §§ 86.346 and 86.347.

§ 86.306-79 Equipment required and specifications; overview.

(a) This subpart contains procedures for both gasoline-fueled and Diesel engine gaseous emission tests. Generally, the equipment required is identical for both types of engines. Equipment required and specifications are found in §§ 86.307 through 86.318.

(b) Some analyzer specifications refer to calibration checks found in §§ 86.320 through 86.332.

§ 86.307-82 Fuel specifications.

(a) *Gasoline.* (1) Gasoline having the following specifications will be used by the Administrator in exhaust emission testing. Gasoline having the following specifications or substantially equivalent specifications approved by the Administrator shall be used by the manufacturer in exhaust testing, except that the lead and octane specifications do not apply.

Item designation	ASTM	Leaded	Unleaded
Octane, research, minimum	D2699	100	9
PB (organic), grams/U.S. gallon		[1] 1.4	0.00-0.0

Item designation	ASTM	Leaded	Unleaded
Distillation Range:			
IBP,°F	D86	75-95	75-95
10 pct point, °F	D86	120-135	120-135
50 pct point, °F	D86	200-230	200-230
90 pct point, °F	D86	300-325	300-325
EP, °F (maximum)	D86	415	415
Sulfur, weight percent, maximum	D1266	0.10	0.10
Phosphorus, grams/U.S. gallon, maximum		0.01	0.005
RVP pounds per square inch	D323	8.0-9.2	8.0-9.2
Hydrocarbon composition:			
Olefins, percent, maximum	D1319	10	10
Aromatics, percent maximum	D1319	35	35
Saturates	D1319	([2])	([2])

[1] Minimum.

[2] Remainder.

(2) Gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation. For leaded fuel the minimum lead content shall be equal to the average lead content found in regular leaded gasoline in the fuel survey prescribed by the Administrator. Where the Administrator determines that engines represented by a test engine will be operated using gasoline of different lead content from that prescribed in this paragraph, he may consent in writing to use of a gasoline with a different lead content. The octane rating of the gasoline used shall be no higher than 4.0 research octane numbers above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers for unleaded fuel and 7.0 octane numbers for leaded fuel, where sensitivity is defined as research octane number minus motor octane number.

(b) *Diesel Fuel.* (1) The diesel fuels employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxident, dehazer, antirust pour depressant, dye, and dispersant.

(2) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emissions testing. The grade of diesel fuel recommended by the engine manufacturer commercially designated as "Type 1-D" or "Type 2-D", shall be used.

Item	ASTM test method No.	Type 1-D	Type 2-D
Cetane Number	D613, D86	48-54	42-50
Distillation range:			
IBP, °F		330-390	340-400
10 percent point, °F		370-430	400-460
50 percent point, °F		410-480	470-540
90 percent point, °F		460-520	550-610
EP, °F		500-560	580-660
Gravity, °AP1	D287	40-44	33-37
Total sulfur, percent	D129 or D2622	0.05-0.02	0.2-0.5
Hydrocarbon composition	D1319		
Aromatics, percent (minimum		[1] 8	[1] 27
Paraffins, naphthenes, olefins		([2])	([2])
Flashpoint, °F (minimum)	D93	120	130
Viscosity, centistokes	D445	1.6-2.0	2.0-3.2

[1] Minimum.

[2] Remainder.

(3) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as "Type 1-D" or "Type 2-D", shall be used.

Item	ASTM test method No.	Type 1-D	Type 2-D
Cetane (minimum)	D613	42-56	38-5
Distillation range 90 pct point, °F	D86	440-530	540-630
Gravity, °AP1	D287	39-45	30-42
Total sulfur, percent	D129 or D2622	0.05	0.2
Flashpoint, °F (minimum)	D96	120	130
Viscosity, centistokes	D445	1.2-2.2	1.5-4.5

[1] Minimum.

(4) Other petroleum distillate fuels may be used for testing and service accumulation provided:

(i) They are commercially available;

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service;

(iii) Use of a fuel listed under paragraphs (b) (2) and (3) of this section would have a detrimental effect on emissions or durability; and

(iv) Written approval from the Administrator of the fuel specifications was provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (b) (2), (3), and (4) of this section shall be reported in accordance with § 86.082-21(b)(3).

(c) Fuels not meeting the specifications set forth in this section may be used only with the advance approval of the Administrator.

[46 FR 50494, Oct. 13, 1981, and 47 FR 49807, Nov. 2, 1982]

§ 86.308-79 Gas specifications.

(a) *Analyzer gases.* (1) *Calibration gases for the CO and CO_2* analyzers shall have zero grade nitrogen as a diluent. Combined CO and CO_2 span gases are permitted. Zero grade nitrogen shall be the diluent for CO and CO_2 span gases.

(2) Calibration or span gases for the hydrocarbon analyzer shall be propane with zero-grade nitrogen as a diluent when testing gasoline-fueled engines. For Diesel engine tests the diluent shall be zero-grade air.

(3) Calibration or span gases for the NO_x analyzer shall be NO named as NO_x with a maximum NO_2 concentration of 5 percent of the nominal value. Zero-grade nitrogen shall be the diluent.

(4) Zero-grade gases for hydrocarbon analyzers shall be nitrogen when testing gasoline-fueled engines and air when testing Diesel engines.

(5) Zero-grade gases for the carbon monoxide, carbon dioxide and oxides of nitrogen analyzers shall be either zero-grade air or zero-grade nitrogen.

(6) The allowable zero grade gas (air or nitrogen) impurity concentrations shall not exceed 2 ppmC hydrocarbon, 10 ppm carbon monoxide, 400 ppm carbon dioxide and 1 ppm nitric oxide.

(7) "Zero-grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

(b) *Calibration gas.* Calibration gas values are to be derived from NBS "Standard Reference Materials" (SRM's) or other gas standards approved by the Administrator. The uncertainty of the assigned calibration gas values shall not exceed 2.0 percent of the assigned value. The uncertainty is defined as the sum of the precision errors (at the 90 percent confidence level) and the bias errors. Precision and bias errors apply to both the equipment and the derivation procedures.

(c) *Span gas.* Span gas values are to be derived from NBS "Standard Reference Materials" (SRM's) or other gas standards approved by the Administrator. The uncertainty of the assigned calibration gas values shall not exceed 3.0 percent of the assigned value. The uncertainty is defined as the sum of the precision errors (at the 90 percent confidence level) and the bias errors. Precision and bias errors apply to both the equipment and the derivation procedures.

(d) *Hydrocarbon analyzer fuel*—(1) *The fuel shall contain 40±2 percent hydrogen.* The balance shall be helium. The mixture shall contain less than 2 ppmC hydrocarbon.

(2) *Alternate pure hydrogen fuel.* Some HFID's are designed to operate on pure hydrogen. Generally the HFID fuel is incompatible with good relative hydrocarbon response.

(i) For Diesel engines this fuel is not recommended. However, this fuel may be used if the engine manufacturer demonstrates, on each basic combustion system (i.e., 4 cycle DI, 2 cycle DI, 4 cycle pre-cup, etc.) that an HFID using this fuel produces comparable results to an HFID using 40% H_2/60% He fuel. These data must be submitted to and approved by the Administrator prior to testing. Pure H_2 fuel, that may be allowed for testing, must contain at least 99.0 percent hydrogen and contain less than 2 ppmC hydrocarbon.

(ii) For gasoline-fueled engines, pure hydrogen fuel for the HFID is not allowed.

(e) *Hydrocarbon analyzer burner air.* The concentration of oxygen must be within 1 mole percent of the oxygen concentration of the burner air used in the latest oxygen interference check (%O_2I). If the difference in oxygen concentration is greater than 1 mole percent, then the oxygen interference must be checked and the analyzer adjusted if necessary, to meet the %O_2I requirements. The burner air must contain less than 2 ppmC hydrocarbon.

(f) Oxygen interference check gases shall contain propane with 350 ppmC±75 ppmC hydrocarbon. The concentration value shall be determined to calibration gas tolerances by chromatographic analysis of total hydrocarbons plus impurities or by dynamic blending. Nitrogen shall be the predominant diluent with the balance oxygen. Blends required for gasoline-fueled and Diesel engine testing are as follows:

Applicability	O_2 concentration (percent)	Balance
Diesel	21 (20 to 22)	N_2
Diesel and gasoline	10 (9 to 11)	N_2
Do	5 (4 to 6)	N_2
Gasoline	0 (0 to 1)	N_2

(g) Proportioning and blending devices may be used to obtain required gas concentration.

[42 FR 45154, Sept. 8, 1977, as amended at 46 FR 50495, Oct. 13, 1981; 47 FR 49807, Nov. 2, 1982]

§ 86.309-79 Sampling and analytical system; schematic drawing.

(a) Any variation from the specifications in this subpart including performance specifications and emission detection methods may be used only with prior approval by the Administrator.

(b) Schematic drawing.

(1) An example of a sampling and analytical system which may be used for testing under this subpart is shown in Figure D79-1. All components or parts of components that are wetted by the sample or corrosive calibration gases shall be either chemically cleaned stainless steel or inert material, e.g. polytetrafluoroethylene resin. The use of "gauge savers" or "protectors" with nonreactive diaphragms to reduce dead volumes is permitted. The specific detection methods to be used for each exhaust component can be found in § 86.316 for CO, § 86.317 for HC, and § 86.318 for NO_x. Additional components such as instruments, valves, solenoids, pumps, switches, etc. may be employed to provide additional information and coordinate the functions of the component systems.

(2) The following requirements must be incorporated in each system used for testing under this subpart.

(i) All analyzers must obtain the sample to be analyzed from the same sample line.

(ii) The sample transport system from the engine exhaust pipe to the HC analyzer and the NO_x analyzer must be heated as is indicated in Figure D79-1.

(iii) Carbon monoxide and carbon dioxide measurements must be made on a dry basis. Specific requirements for the means of drying the sample can be found in § 86.309 (b)(5) and § 86.311(e).

(iv) All NDIR analyzers must have a pressure gauge immediately downstream of the analyzer. The gauge tap must be within 2 inches of the analyzer exit port. Gauge specifications can be found in § 86.309(b)(3).

(v) All bypass and analyzer flows exiting the analysis system must be measured. Capillary flows such as in HFID and CL analyzers are excluded. For each ND IR analyzer with a flow meter located upstream of the analyzer, and upstream pressure gauge must be used. The gauge tap must be within 2 inches of the analyzer entrance port.

(vi) Calibration or span gases for the NO_x measurement system must pass through the NO_2 to NO converter.

(vii) The temperature of the NO_2 to NO converter must be displayed continuously.

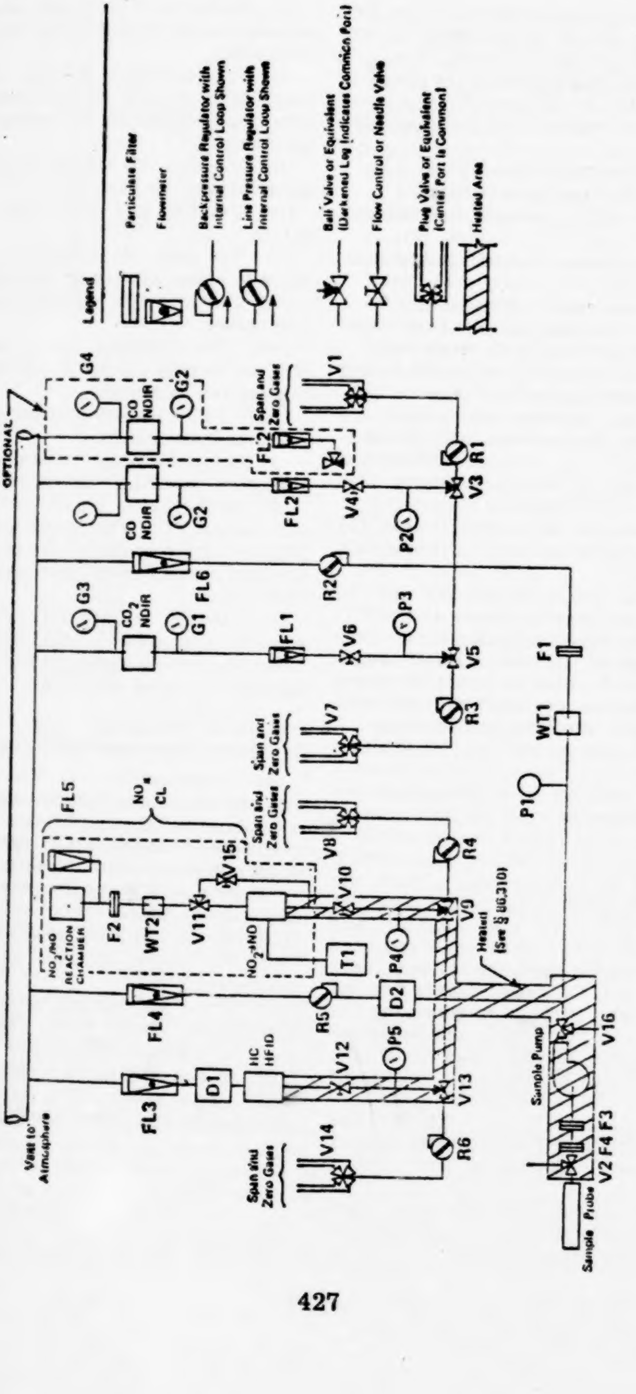

Legend
Particulate Filter
Flowmeter
Backpressure Regulator with Internal Control Loop Shown
Line Pressure Regulator with Internal Control Loop Shown
Ball Valve or Equivalent (Darkened Leg Indicates Common Port)
Flow Control or Needle Valve
Plug Valve or Equivalent (Center Port Is Common)
Heated Area
OPTIONAL
Vent to Atmosphere
G4
CO NDIR
G2
Span and Zero Gases
V1
FL2
R1
V3
V4
P2
CO NDIR
G2
FL6
R2
G3
CO2 NDIR
G1
FL1
V6
P3
V5
F1
WT1
R3
V7
Span and Zero Gases
FL5
NOx CL
Span and Zero Gases
V8
R4
P1
V15
V10
V9
Heated (See § 86.310)
NO2/NO REACTION CHAMBER
F2
WT2
V11
NO2→NO
T1
P4
D2
FL4
R5
P5
V12
HC HFID
D1
FL3
V13
V16
Sample Pump
V14
Span and Zero Gases
R6
V2 F4 F3
Sample Probe

Figure D79-1 HEAVY DUTY EXHAUST GAS SAMPLING AND ANALYTICAL TRAIN

(c) *System components list.* The following is a list of components shown in Fig. D79-1 by numeric identifier.

(1) *Filters.* Glass fiber filter paper is permitted for F1, F2, and F3. Optional filter F4 is a coarse filter for large particulates.

(i) F1—Fine particulate filter.

(ii) F2—Fine particulate filter.

(iii) F3—Fine heated particulate filter.

(iv) F4—Coarse heated particulate filter.

(2) *Flowmeters.* (i) Flowmeters FL 1 and FL 2 indicate sample flow rates through the CO and CO_2 analyzers.

(ii) Flowmeters FL 3, FL 4, FL 5, and FL 6 indicate bypass flow rates.

(3) *Gauges.* Downstream gauges are required for any system used for testing under this subpart. Upstream gauges may be required under this subpart per § 86.309(b)(2)(v).

(i) Upstream gauges G1 and G2 measure the input to the CO and CO_2 analyzers.

(ii) Downstream gauges G3 and G4 measure the exit pressure of the CO and CO_2 analyzers. If the normal operating range of the downstream gauges is less than 3 inches of water, then the downstream gauges must be capable of reading both pressure and vacuum.

(4) *Pressure gauges.* (i) P1—bypass pressure.

(ii) P2, P3, P4 and P5—sample or span pressure at inlet to flow control valves.

(5) *Water traps.* Water traps WT1, and WT2 to remove water from the sample. A water trap performing the function of WT1 and meeting the specifications in § 86.311(e) is required for any system used for testing under this subpart. Chemical dryers are not an acceptable method of removing the water. Water removal by condensation is acceptable. Means other than condensation may be used only with prior approval from the Administrator.

(6) *Regulators.* (i) R1, R3, R4, and R6—linepressure regulators to control span pressure at inlet to flow control valves.

(ii) R2 and R5—back presssure regulators to control sample pressure at inlet to flow control valves.

(7) *Valves.* (i) V1, V7, V8, and V14—selector valves to select zero or calibration gases.

(ii) V2—optional heated selector valve to purge the sample probe, perform leak checks, or to perform hang-up checks.

(iii) V3 and V5—Selector valves to select sample or span gases.

(iv) V4, V6, and V15—flow control valves.

(v) V9 and V13—heated selector valve to select sample or span gases.

(vi) V10 and V12—heated flow control valves.

(vii) VII—Selector valve to select NO_x or bypass mode in the chemiluminescence analyzer.

(viii) V16—heated selector valve to perform leak checks.

(8) *Pump.* Sample transfer pump to transport sample to analyzers.

(9) *Temperature sensor.* A temperature sensor (T1) to measure the NO_2 to NO converter temperature is required for any system used for testing under this subpart.

(10) *Dryer.* Dryers D1 and D2 to remove the water from the bypass flows to prevent condensation in flowmeters FL3, FL4, and FL6.

§ 86.310-79 Sampling and analytical system; component specifications.

(a) *Temperature.* (1) *For gasoline-fueled engines any heated component;*

(i) In the HC sample path must be maintained above 110°C (230°F) and shall not exceed 230°C (446°F).

(ii) In the NO_x sample path must be maintained above 60°C (140°F) and shall not exceed 230°C (446°F).

(2) *For Diesel engines any heated component;*

(i) In the HC sample path must be maintained above 180°C (356°F) and shall not exceed 230°C (446°F).

(ii) In the NO_x sample path must be maintained above 60°C (140°F) and shall not exceed 230°C (446°F).

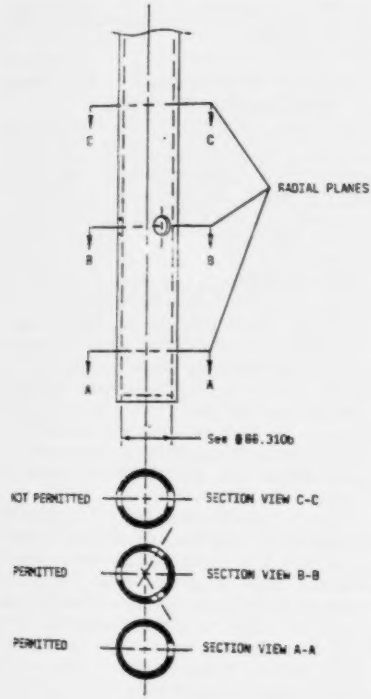


Figure D79-2 SAMPLE PROBE AND TYPICAL HOLE SPACINGS

(3) The sample line outside wall temperature must be maintained at the temperature specified in this paragraph. An exception is made for the first 4 feet of sample line from the exhaust duct. The upper temperature tolerance for this 4 foot section is waived and only the minimum temperature specification applies.

(b) *Sample probe.* (1) The sample probe shall be a straight, closed end, stainless steel, multi-hole probe. The Inside Diameter (I.D.) shall not be greater than the I.D. of the sample line (+.010 in.). The wall thickness of the probe shall not be greater than .040 inch. The fitting that attaches the probe to the exhaust pipe shall be as small as practical in order to minimize heat loss from the probe.

(2) There shall be a minimum of three holes in the probe. The spacing of the radial planes for each hole in the probe must be such that they cover approximately equal cross-sectional areas of the exhause duct. The angular spacing of the holes must be approximately equal. The angular spacing of any two holes in one plane may not be 180° ±20° (i.e., section C-C of Figure D79-2). The holes should be sized such that each has approximately the same flow. If only three holes are used, they may not all be in the same radial plane. See Figure D79-2.

(3) The probe shall extend radially across the exhaust duct. The probe must pass through the approximate center and must extend across at least 80 percent of the diameter of the duct.

(c) *Sample transfer.* (1) The maximum I.D. of the sample line shall not exceed 0.52 inch.

(2) If valve V2 is used, the sample probe must connect directly to valve V2. The location of optional valve V2 may not be greater than 4 feet from the exhaust duct.

(3) The location of optional valve V16 may not be greater than 24 inches from the sample pump. The leakage rate for this section on the pressure side of the sample pump may not exceed the leakage rate specification for the vacuum side of the pump.

(d) *Venting.* All vents including analyzer vents, bypass flow, and pressure relief vents of regulators should be vented in such a manner to avoid endangering personnel in the immediate area.

[42 FR 45154, Sept. 8, 1977, as amended at 46 FR 50495, Oct. 13, 1981, and 47 FR 49807, Nov. 2, 1982]

§ 86.311-79 Miscellaneous equipment; specifications.

(a) *Chart recorders.* (1) The minimum chart speed allowed is 3 inches per minute for gasoline-fueled engines and 0.5 inches per minute for Diesel engines.

(2) When testing gasoline-fueled engines all chart recorders (analyzers, torque, rpm, etc.) shall be provided with Automatic markers which indicate one second intervals. Preprinted chart paper (one second intervals) may be used in lieu of the automatic

markers provided the correct chart speed is used.

(b) *Accuracy of temperature measurements.* (1) The following temperature measurements shall be accurate to within 1.2° C:

(i) Temperature measurements used in calculating the engine intake humidity:

(ii) The temperature of the fuel in volume measuring flow rate devices;

(iii) The temperature of the sample within the water trap(s).

(2) All other temperature measurements shall be accurate within 2.5° C.

(c) *Intake air humidity and temperature measurements.* (1) Humidity conditioned air supply. Air that has had its absolute humidity altered is considered humidity-conditioned air. For this type of intake air supply, the humidity measurements must be made within the intake air supply system, and after the humidity conditioning has taken place.

(2) *Nonconditioned air supply.* Humidity measurements in non-conditioned intake air supply systems must be made in the intake air stream entering the supply system. Alternatively, the humidity measurements can be measured within the intake air supply stream.

(3) Engine intake air temperature measurement must be made within 48 inches of the engine. The measurement location must be made either in the supply system or in the air stream entering the supply system.

(d) *Sample component surface temperature.* For each component (pump, sample line section, filters, etc.) in the heated portion of the sampling system that has a separate source of power or heating element, use engineering judgment to locate the coolest portion of that component and monitor the temperature at that location. If several components are within an oven, then only the surface temperature of the component with the largest thermal mass and the oven temperature need be measured.

(e) If water is removed by condensation, the sample gas temperature or sample dew point must be monitored either within the water trap or downstream. It may not exceed 7°C (45°F).

[42 FR 45154, Sept. 8, 1977, as amended at 46 FR 50495, Oct. 13, 1981; 47 FR 49807, Nov. 2, 1982]

§ 86.312-79 Dynamometer and engine equipment specifications.

(a) *Dynamometer.* (1) The dynamometer test stand and other instruments for measurement of power output shall be accurate to within 2 percent of point at all power settings above 10 percent of full-scale. Below 10 percent of full-scale the accuracy shall be within 5 percent of point. The dynamometer must be capable of performing the test cycle described in § 86,335 or § 86.336. Dynamometers used for testing gasoline-fueled engines must have sufficient motoring capability to meet the test requirements. A 60-tooth wheel in combination with a frequency counter shall be considered an absolute standard for engine speed.

(2) *Dynamometer calibration weights.* A minimum of 6 calibration weights for each range used are required. The weights must be equally spaced and traceable to within 0.5 percent of NBS weights. Laboratories located in foreign countries may certify calibration weights to local government bureau standards.

(b) *Engine cooling.* Means of engine cooling which will maintain the engine operating temperatures (e.g., intake air, oil, water, etc.) at approximately the same temperature as specified by the manufacturer shall be used. Auxiliary fan(s) may be used to maintain engine cooling during operation on the dynamometer.

(c) *Exhaust system.* (1) When testing gasoline-fueled engines:

(i) A chassis-type exhaust system including muffler(s) shall be used. The exhaust system must have a single tail pipe. For engines designed for a dual exhaust system, a standard or specially fabricated "Y" pipe may be used. The "Y" pipe may be located upstream of a single muffler or downstream of a single muffler or downstream of dual mufflers. The potential increase in backpressure due to the use of a single tail pipe instead of dual pipes may be compensated for by using larger than standard exhaust system components downstream of the

"Y" pipe. For systems with the "Y" pipe upstream of the muffler, the backpressure at the exhaust manifold exit with the single exhaust system must be comparable to the standard dual exhaust system under the test conditions specified in § 86.335.

(ii) For all catalyst systems the distance from the exhaust manifold flange(s) to the catalyst shall be the same as in the vehicle configuration unless the manufacturer provides temperature data showing equivalent performance at another location.

(iii) For catalyst systems, the probe shall be located in the single exhaust pipe and from 2 to 10 feet downstream of the catalyst(s) and at least 2 feet downstream of the "Y" intersection of any "Y" pipe (if used).

(iv) For noncatalyst systems, the probe shall be located in the single exhaust pipe downstream of the muffler(s) and from 3 to 20 feet downstream from the exhaust manifold flange or turbocharger exit flange. The probe shall also be at least 2 feet downstream of the "Y" intersection of any "Y" pipe (if used).

(v) For all exhaust systems, the probe shall be located at least 24 inches from the end of the tail pipe. Additional exhaust pipe may be added to the tail pipe to meet the specification.

(2) When testing Diesel engines, a noninsulated exhaust system extending 15±5 feet from the exhaust manifold, or the crossover junction in the case of Vee engines, shall be used. The exhaust back pressure must be within 0.2 inch Hg. of the upper limit at maximum rated horsepower, as established by the engine manufacturer in his sales and service literature for vehicle application. A conventional automotive muffler of a size and type commonly used with the engine being tested shall be employed in the exhaust system during smoke emission testing. The terminal 2 feet of the exhaust pipe shall be a circular cross section and be free of elbows and bends. The end of the pipe shall be cut off squarely. The terminal 2 feet of the exhaust pipe shall have a nominal inside diameter in accordance with the engine being tested, as specified below:

Maximum rated horsepower	Exhaust pipe inside diameter (inches)
Less than 101	2
101 to 200	3
201 to 300	4
301 or more	5

[42 FR 45154, Sept. 8, 1977, as amended at 43 FR 52922, Nov. 14, 1978]

§ 86.313-79 Air flow measurement specifications; diesel engines.

(a) The air flow measurement method used must have a range large enough to accurately measure the air flow over the engine operating range during the test. Overall measurement accuracy must be ±2 percent of full-scale value of the measurement device for all modes except the idle and 2-percent modes. For the idle and 2-percent modes, the measurement accuracy shall be ±5 percent or less of the full-scale value. The Administrator must be advised of the method used prior to testing.

(b) Corrections to the measured air mass-flow-rate shall be made when an engine system incorporates devices that add or subtract air mass (air injection, bleed air, etc.). The method used to determine the air mass from these devices shall be approved by the Administrator.

(c) An engine air inlet system presenting an air inlet restriction within 1 inch of water of the upper limit for the engine operating condition which results in maximum air flow, as established by the engine manufacturer in his sales and service literature, for the Diesel engine being tested shall be used.

§ 86.314-79 Fuel flow measurement specifications.

(a) The fuel flow rate measurement instrument must have a minimum accuracy of ±1 percent of full-scale flow rate for each measurement range used. An exception for Diesel engines is allowed at the idle and 2-percent power points. For these modes, the minimum accuracy is ±2 percent of full-scale flow rate for each measurement range used. The controlling parameters are the elapsed time measurement of the event and the weight or volume measurement. Restrictions on these parameters are:

(1) The error in the elapsed time measurement of the event must not be greater than 1 percent of the absolute event time. This includes errors in starting and stopping the clock as well as the period of the clock.

(2) For Diesel engines only, if the mass of fuel consumed is measured by discrete weights, then the error in the actual weight of the fuel consumed must not be greater than ±1 percent of the measuring weight. An exception for Diesel engines is allowed at the idle and 2-percent power points. For these modes the error in the actual weight of the fuel consumed must not be greater than ±2 percent of the measuring weight.

(3) If the mass of fuel consumed is measured electronically (load cell, load beam, etc.), the error in the actual weight of fuel consumed must not be greater than ±1 percent of the full-scale value of the electronic device.

(4) If the mass of fuel consumed is measured by volume flow and density, the error in the actual volume consumed must not be greater than ±1 percent of the full-scale value of the volume measuring device.

(b) For the devices that have varying mass scales (electronic weight, volume, density, etc.), measurements may not be used for calculations if the measurement is less than 20 percent of full scale.

(c) *Option.* Complete flow-rate measurement systems may be used below 20 percent of full-scale measurement as long as the combination of mass and time measurments indicate a flow rate that has an error of less than 5 percent of the absolute flow rate.

§ 86.315-79 General analyzer specifications.

(a) *Analyzer response time.* The analyzer must respond to an instantaneous step change at the entrance to the analyzer with a response equal to 95 percent of that step change in 6.0 seconds or less on all ranges used. The step change shall be at least 60 percent of full-scale chart deflection. For NO$_x$ analyzers using a water trap, the response time increase due to the water trap and associated plumbing need not be included in the analyzer response time.

(b) *Precision.* The precision of the analyzer must be no greater than ±1 percent of full-scale concentration for each range used above 155 ppm (or ppm C), or ±2 percent for each range used below 155 ppm (or ppm C). The precision is defined as 2.5 times the standard deviation(s) of 10 repetitive responses to a given calibration or span gas.

(c) *Noise.* The analyzer peak-to-peak response to zero and calibration or span gases over any 10-second period shall not exceed 2 percent of full-scale chart deflection on all ranges used.

(d) *Zero drift.* The analyzer zero-response drift during a 1-hour period shall be less than 2 percent of full-scale chart deflection on the lowest range used. The zero-response is defined as the mean response including noise to a zero-gas during a 30-second time interval.

(e) *Span drift.* The analyzer span drift during a 1-hour period shall be less than 2 percent of full-scale chart deflection on the lowest range used. The analyzer span is defined as the difference between the span-response and the zero-response. The span-response is defined as the mean response including noise to a span gas during a 30-second time interval.

(Secs. 206, 301(a), Clean Air Act as amended (42 U.S.C. 7525, 7601(a)))

[42 FR 45154, Sept. 8, 1977, as amended at 44 FR 16917, Mar. 20, 1979]

§ 86.316-79 Carbon monoxide and carbon dioxide analyzer specifications.

(a) Carbon monoxide and carbon dioxide measurements are to be made with nondispersive infrared (NDIR) analyzers.

(b) The use of linearizing circuits is permitted.

(c) The minimum water rejection ratio (maximum CO$_2$ interference) as measured by § 86.321 shall be:

(1) For CO analyzers, 1000:1.

(2) For CO$_2$ analyzers, 100:1.

(d) The minimum CO$_2$ rejection ratio (maximum CO$_2$ interference) as measured by § 86.322 for CO analyzers shall be 5000:1.

(e) *Zero suppression.* Various techniques of zero suppression may be used to increase readability, but only with prior approval by the Administrator.

§ 86.317-79 Hydrocarbon analyzer specifications.

(a) Hydrocarbon measurements are to be made with a heated flame ionization detector (HFID) analyzer.

(b) *Option.* A non-heated flame ionization detector (FID) that measures hydrocarbon emissions on a dry basis is permitted for gasoline-fueled testing; *Provided,* That equivalency is demonstrated to the Administrator. With the exception of temperatures, all specifications contained in Subpart D apply to the optional system.

(c) The analyzer shall be fitted with a constant temperature oven housing the detector and sample-handling components. It shall maintain temperature with 2° C of the set point. The detector, oven, and sample-handling components within the oven shall be suitable for continuous operation at temperatures to 200° C.

(d) Fuel and burner air shall conform to the specifications in § 86.308.

(e) The percent of oxygen interference must be less than 3 percent, as specified in § 86.331(d)(7).

(f) Premixed burner air:

(1) For Diesel engines, premixing a small amount of air with the HFID fuel prior to combustion within the HFID burner is not recommended as a means of improving oxygen interference (%O_2I). However, this procedure may be used if the engine manufacturer demonstrates on each basic combustion system (i.e., 4 cycle DI, 2 cycle DI, 4 cycle precup, etc.) that an HFID using this procedure produces comparable results to an HFID not using this procedure. These data must be submitted to the Administrator for his approval prior to testing.

(2) For gasoline-fueled engines, premixing burner air with the HFID fuel is not allowed.

§ 86.318-79 Oxides of nitrogen analyzer specifications.

(a) Oxides of nitrogen are to be measured with a chemiluminescense analyzer.

(1) The NO_x sample must be heated per § 86.309(a) and § 86.310(a) up to the NO_2 to NO converter.

(2) For high vacuum CL analyzers with heated capillary modules, supplying a heated sample to the capillary module is sufficient.

(3) The NO_2 to NO convertor efficiency shall be at least 90 percent.

(4) The quench interference must be less than 3.0 percent as measured in § 86.327.

(b) *Option.* The oxides of nitrogen may be measured with an NDIR analyzer system that meets the following specifications:

(1) The system shall include an NO_2 to NO converter, a water trap, and an NDIR analyzer in that order.

(2) The NO_2 to NO converter shall obtain a sample directly from the heated sample line.

(3) The water trap shall meet the specifications in § 86.311(e).

(4) The NO NDIR analyzer shall be calibrated per § 86.330.

(5) The minimum water rejection ratio (maximum water interference) for the NO NDIR analyzer shall be 5,000:1 (see § 86.321).

(6) The minimum CO_2 rejection ratio (maximum CO_2 interference) for the NO NDIR analyzer shall be 30,000:1 (see § 86.322).

§ 86.319-79 Analyzer checks and calibrations; frequency and overview.

(a) Prior to initial use and after major repairs, bench check each analyzer (see § 86.320).

(b) At least once every 7 days during testing, check the NO_x converter efficiency (see § 86.332).

(c) At least once every 30 days during testing, perform the following:

(1) Leak check the pressure side of the system (see § 86.328). If the option described in § 86.328(b)(2) is used, a pressure leak check is not required.

(2) Calibrate all analyzers (see §§ 86.330 through 86.332).

(3) Check the analysis system response time (see § 86.329). If the option described in § 86.329(b) is used, a response time check is not required.

(4) Verify that the automatic data collection system (if used) meets the

chart reading requirements found in § 86.343.

(5) Check the fuel flow measurement instrument to insure that the specifications in § 86.314 are met. Flow meters of the tapered tube and float design (rotometers) or the balance beam principle need be checked only every 90 days.

(d) At least once every 90 days during testing check the water rejection ratio and the CO_2 rejection ratio on all NDIR analyzers (see §§ 86.321 and 86.322).

(e) At least once every 180 days during testing check the dynamometer test stand and power output instrumentation (see § 86.333).

§ 86.320–79 Analyzer bench check.

(a) Prior to initial use and after major repairs verify that each analyzer complies with the following specifications:

(1) Response time (see § 86.315(a)).

(2) Precision (see § 86.315(b)).

(3) Noise (see § 86.315(c)).

(4) Zero drift (see § 86.315(d)).

(5) Span drift (see § 86.315(e)).

(6) Water rejection ratio, NDIR analyzers only (see §§ 86.316(c) and 86.318(b)(5).

(7) CO_2 rejection ratio, NDIR analyzers only (see §§ 86.316(d) and 86.318(b)(6)).

(8) Quench check, CL analyzers only (see § 86.327).

(b) If a stainless steel NO_2 to NO converter is used, condition all new or replacement converters. The conditioning consists of either purging the converter with air for a minimum of 4 hours or until the converter efficiency is greater than 90 percent. The converter must be at operational temperature while purging. Do not use this procedure prior to checking converter efficiency on in-use converters.

§ 86.321–79 NDIR water rejection ratio check.

(a) Zero and span the analyzer on the lowest range that will be used.

(b) Introduce a saturated mixture of water and zero gas at room temperature directly to the analyzer.

(c) Determine and record the analyzer operating pressure (*GP*) in absolute units in pascals. Gauges G3 and G4 may be used if the values are converted to the correct units.

(d) Determine and record the temperature of the zero-gas mixture.

(e) Record the analyzers' response (*AR*) in ppm to the saturated zero-gas mixture.

(f) For the temperature recorded in step (d), determine the saturation vapor presssure (P_{WB}) from § 86.344(d).

(g) Calculate the water concentration (*Z*) in the mixture from:

$$Z=(P_{WB}/GP)(10^6)$$

(h) Calculate the water rejection ratio (*WRR*) from:

$$WRR=(Z/AR)$$

§ 86.322–79 NDIR CO_2 rejection ratio check.

(a) Zero and span the analyzer on the lowest range that will be used.

(b) Introduce a CO_2 calibration gas of at least 10 percent CO_2 or greater to the analyzer.

(c) Record the CO_2 calibration gas concentration in *ppm*.

(d) Record the analyzers' response (*AR*) in *ppm* to the CO_2 calibration gas.

(e) Calculate the CO_2 rejection ratio (CO_2RR) from:

$$CO_2RR=(ppm\ CO_2)/AR$$

§ 86.327–79 Quench checks; NO_x analyzer.

(a) Perform the reaction chamber quench check for each model of high vacuum reaction chamber analyzer prior to initial use.

(b) Perform the reaction chamber quench check for each new analyzer that has an ambient pressure or "soft vacuum" reaction chamber prior to initial use. Additionally, perform this check prior to reusing an analyzer of this type any time any repairs could potentially alter any flow rate into the reaction chamber. This includes, but is not limited to, sample capillary, ozone capillary, and if used, dilution capillary.

(c) Quench check as follows:

(1) Calibrate the NO_x analyzer on the lowest range that will be used for testing.

(2) Introduce a mixture of CO_2 calibration gas and NO_x calibration gas to

the CL analyzer. Dynamic blending may be used to provide this mixture. Dynamic blending may be accomplished by analyzing the CO_2 in the mixture. The change in the CO_2 value due to blending may then be used to determine the true concentration of the NO_x in the mixture. The CO_2 concentration of the mixture shall be approximately equal to the highest concentration experienced during testing. Record the response.

(3) *Recheck the calibration.* If it has changed more than ±1 percent of full scale, recalibrate and repeat the quench check.

(4) Prior to testing, the difference between the calculated NOx response and the response of NOx in the presence of CO_2 (step 2) must not be greater than 3.0 percent of full-scale. The calculated NOx response is based on the calibration performed in step (1).

(Secs. 206, 301(a), Clean Air Act as amended (42 U.S.C. 7525, 7601(a)))

[42 FR 45154, Sept. 8, 1977, as amended at 44 FR 16917, Mar. 20, 1979]

§ 86.328-79 Leak checks.

(a) *Vacuum side leak check.* (1) Any location within the analysis system where a vacuum leak could affect the test results must be checked.

(2) The maximum allowable leakage rate on the vacuum side is 0.5 percent of the in-use flow rate for the portion of the system being checked. the analyzer flows and bypass flows may be used to estimate the in-use flow rates.

(3) The sample probe and the connection between the sample probe and valve V2 (Figure D79-1) may be excluded from the leak check.

(b) *Pressure side leak check.* (1) The maximum allowable leakage rate on the pressure side in 5 percent of the in-use flow rate.

(2) Option: If the flow rate for each flow meter is equal to or greater than the flow rate recorded in § 86.329(b)(1)(ii), then a pressure side leak check is not required.

§ 86.329-79 System response time; check procedure.

(a) Check the system response time by the following procedure:

(1) Stabilize the operating temperature of the sample line, sample pump, and heated filters.

(2) Introduce an HC span gas into the sampling system at the sample probe or valve V2 at atmospheric pressure. Simultaneously, start the time measurement.

(3) When the HC instrument response is 95 percent of the span gas concentration used, stop the time measurement.

(4) If the elapsed time is more than 20.0 seconds, make necessary adjustments.

(5) Repeat with the CO, CO_2, and NO_x instruments and span gases.

(b) *Option.* If the following parameters are determined, the initial system response time may be generally applied to future checks.

(1) *Analyzer and bypass flow rates.* (i) Determine by experimentation the minimum analyzer and bypass flow rates individually and in combination that will produce a response time as close as possible to 20.0 seconds per paragraph (a) of this section.

(ii) Record the highest minimum flow rate for each flow meter as determined in step (i).

(2) *Capillary flow analyzers.* This procedure is applicable only to analyzers that have sample capillaries such as the HFID and CL analyzers. It is also assumed that the system has sample/span valves that perform the function of valves V9 and V13 in Figure D79-1.

(i) Operate the analyzer(s) at the in-use capillary pressure.

(ii) Adjust the bypass flow rate to the flow rate recorded in paragraph (b)(1)(ii) of this section.

(iii) Measure and record the response time from the sample/span valve(s) per paragraph (a) of this section.

(iv) The response time (step (iii)) can be determined by switching from the "sample" position to the "span" position of the sample/span valve and observing the analyzer response on a chart recorder. Normally, the "sample" position would select a "room air" sample and the "span" position would select a span gas.

(v) Adjust the bypass flow rate to the normal in-use value.

(vi) Measure and record the response time from the sample/span valve(s) per paragraph (a) of this section.

(vii) Determine the slowest response time (step (iii) or step (iv)) and add 2 seconds to it.

§ 86.330–79 NDIR analyzer calibration.

(a) *Detector optimization.* If necessary, follow the manufacturer's instructions for initial start-up and basic operating adjustments.

(b) *Calibration curve.* Develop a calibration curve for each range used as follows:

(1) Zero the analyzer.

(2) Span the analyzer to give a response of approximately 90 percent of full-scale chart deflection.

(3) *Recheck the zero response.* If it has changed more than 0.5 percent of full scale, repeat steps (1) and (2).

(4) Record the response of calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of full-scale concentration.

(5) *Generate a calibration curve.* The calibration curve shall be of fourth order or less, have five or fewer coefficients, and be of the form of equation (1) or (2). Include zero as a data point. Compensation for known impurities in the zero gas can be made to the zero-data point. The calibration curve must fit the data points within 2 percent of point or 1 percent of full scale, whichever is less.

$$y = Ax^4 + Bx^3 + Cx^2 + Dx + E \tag{1}$$

$$y = \frac{x}{Ax^4 + Bx^3 + Cx^2 + Dx + E} \tag{2}$$

where:

y=concentration

x=chart deflection

(6) *Option.* A new calibration curve need not be generated if: (i) A calibration curve conforming to step (5) exists; (ii) The responses generated in step (4) are within 1 percent of full scale or 2 percent of point, whichever is less, of the responses predicted by the calibration curve for the gases used in step (4).

(7) If multiple range analyzers are used, only the lowest range must meet the curve fit requirements below 15 percent of full scale.

(c) If any range is within 2 percent of being linear a linear calibration may be used. To determine if this criterion is met:

(1) Perform a linear least-square regression on the data generated. Use an equation of the form $y=mx$, where x is the actual chart deflection and y is the concentration.

(2) Use the equation $z=y/m$ to find the linear chart deflection (z) for each calibration gas concentration (y).

(3) Determine the linearity (%L) for each calibration gas by:

$$\text{Percent } L = \frac{(z-x)}{\text{Full-scale linear chart deflection}} (100)$$

(4) The linearity criterion is met if the %L is less than ±2 percent for each data point generated. For each emission test, a calibration curve of the form $Y=mx$ is to be used. The slope (m) is defined for each range by the spanning process.

[42 FR 45154, Sept. 8, 1977, as amended at 46 FR 50495, Oct. 13, 1981; 47 FR 49807, Nov. 2, 1982]

§ 86.331–79 Hydrocarbon analyzer calibration.

The following steps are followed in sequence to calibrate the hydrocarbon analyzer. It is suggested, but not required, that efforts be made to minimize relative response variations.

(a) If necessary, follow manufacturer's instructions for instrument startup and basic operating adjustments.

(b) Set the oven temperature 5°C hotter than the required sample-line temperature. Allow at least one-half hour after the oven has reached temperature for the system to equilibrate.

(c) *Initial fuel flow adjustment.* With the fuel and air-flow rates set at the manufacturer's recommendations, introduce a 350 ppmC±75 ppmC span gas to the detector. Determine the response at a given fuel flow from the difference between the span-gas response and the zero-gas response. Incrementally adjust the fuel flow above and below the manufacturer's specification. Record the span and zero response at these fuel flows. A plot of the difference between the span and zero response versus fuel flow will be similar to the one shown in Fig. D79-3. Adjust the fuel-flow rate to the rich side of the curve, as shown. This is initial flow-rate setting and may not be the final optimized flow rate.

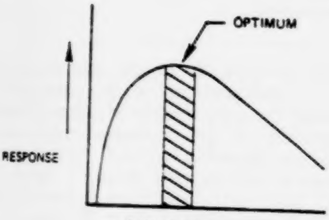


Figure D79-3 RESPONSE VS. FUEL FLOW

(d) *Oxygen interference optimization.* Choose a range where the oxygen interference check gases (see § 86.308) will fall in the upper 50 percent. Conduct this test with the oven temperature set as required. Oxygen interference check gas specifications are found in § 86.308.

(1) Zero the analyzer.

(2) Span the analyzer with the zero-percent oxygen blend for gasoline-fueled engines. Diesel engine instruments shall be spanned with the 21-percent oxygen blend.

(3) *Recheck zero response.* If it has changed more than 0.5 percent of full scale repeat paragraphs (d) (1) and (2) of this section.

(4) Introduce the 5 percent and 10 percent oxygen interference check gases.

(5) *Recheck the zero response.* If it has changed more ±1 percent of full scale, repeat the test.

(6) Calculate the percent of oxygen interference ($\%O_2I$) *for each mixture in step (4).*

$$\text{Percent } O_2I = \frac{B - \text{Analyser response } (ppmC)}{B}\ (100)$$

$$\text{Analyser response} = \frac{A}{\text{Percent of full-scale analyzer response due to } A} \times (\text{Percent of full-scale analyser response due to } B)$$

A = hydrocarbon concentration (*ppmC*) of the span gas used in step (2).

B = hydrocarbon concentration (*ppmC*) of the oxygen interference check gases used in step (4).

(7) The percent of oxygen interference ($\%O_2I$) must be less than ±3.0 percent for all required oxygen interference check gases prior to testing.

(8) If the oxygen interference is greater than the specifications, incrementally adjust the air flow above and below the manufacturer's specifications, repeating paragraphs (d) (1) through (7) of this section for each flow.

(9) If the oxygen interference is greater than the specification after adjusting the air flow, vary the fuel flow and thereafter the sample flow, repeating paragraphs (d) (1) through (7) of this section for each new setting.

(10) If the oxygen interference is still greater than the specifications, repair or replace the analyzer, FID fuel, or burner air prior to testing. Repeat this section with the repaired or replaced equipment or gases.

(e) *Linearity check.* For each range used, check linearity as follows:

(1) With the fuel flow, air flow and sample flow adjust to meet the oxygen interference specification, zero the analyzer.

(2) Span the analyzer using a calibration gas that will provide a response of approximately 90 percent of full-scale concentration.

(3) *Recheck the zero response.* If it has changed more than 0.5 percent of full scale, repeat steps (1) and (2).

(4) Record the response of calibration gases having nominal concentrations of 30, 60, and 90 percent of full-scale concentration. It is permitted to use additional concentrations.

(5) Perform a linear least square regression on the data generated. Use an equation of the form $y=mx$, where x is the actual chart deflection and y is the concentration.

(6) Use the equation $z=y/m$ to find the linear chart deflection (z) for each calibration gas concentration (y).

(7) Determine the linearity (%L) for each calibration gas by:

$$\text{Percent } L = \frac{(z-x)}{\text{Full-scale linear chart deflection}} \times 100$$

(8) The linearity criterion is met if the %L is less than ±2 percent for each data point generated. Below 40 *ppmC* the linearity criterion may be expanded to ±4 percent. For each emission test, a calibration curve of the form $y=mx$ is to be used. The slope (m) is defined for each range by the spanning process.

(9) If the %L for any point exceeds the specifications in step (8), the air, fuel, and sample-flow rates may be varied within the boundaries of the oxygen interference specifications.

(10) If the %L for any data point still exceeds the specifications, repair or replace the analyzer, FID fuel, burner air, or calibration bottles prior to testing. Repeat the procedures of this section with the repaired or replaced equipment or gases.

(f) *Optimized flow rates.* The fuel-flow rate, air-flow rate and sample-flow rate are defined as "optimized" at this point.

§ 86.332-79 Oxides of nitrogen analyzer calibration.

(a) Perform a converter-efficiency check (see paragraph (b) of this section), every 7 days. Every 30 days perform a linearity check (see paragraph (c) of this section), which must be followed by a converter efficiency check. However, if the converter quick-check (see paragraphs (d) and (e) of this section) is performed every 7 days, the full converter efficiency check need only be performed every 30 days.

(b) *Converter-efficiency check.* The apparatus described and illustrated in Figure D79-4 is to be used to determine the conversion efficiency of devices that convert NO_2 to NO. The following procedure is to be used in determining the values to be used in the equation below:

(1) Follow the manufacturer's instructions for instrument startup and operation.

(2) Zero the oxides of nitrogen analyzer.

(3) Connect the outlet of the NO_x generator (see Figure D79-4) to the sample inlet of the oxides of nitrogen analyzer which has been set to the most common operating range.

(4) Introduce into the NO_x generator-analyzer system a span gas with a NO concentration equal to approximately 80 percent of the most common operating range.

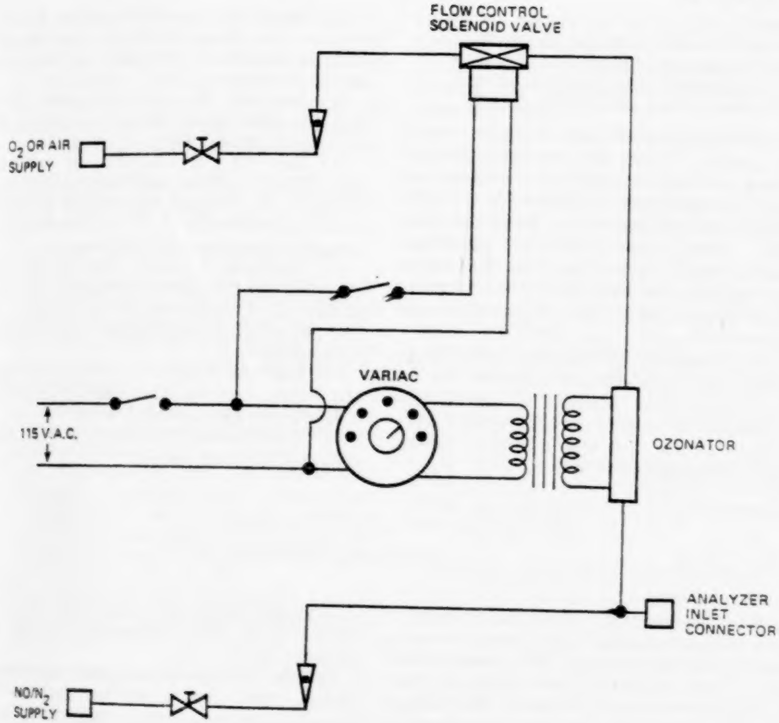


FIGURE D79-4 NO_x CONVERTER EFFICIENCY DETECTOR

(5) With the oxides of nitrogen analyzer in the NO Mode, record the concentration of NO indicated by the analyzer.

(6) Turn on the NO_x generator O_2 (or air) supply and adjust the O_2 (or air) flow rate so that the NO indicated by the analyzer is about 10 percent less than indicated in step (5). Record the concentration of NO in this $NO+O_2$ mixture.

(7) Switch the NO_x generator to the generation mode and adjust the generation rate so that the NO measured on the analyzer is 20 percent of that measured in step (5). There must be at least 10 percent unreacted NO at this point. Record the concentration of residual NO.

(8) Switch the oxides of nitrogen analyzer to the NO_x mode and measure total NO_x. Record this value.

(9) Switch off the NO_x generation, but maintain gas flow through the system. The oxides of nitrogen analyzer will indicate the total NO_x in the $NO+O_2$ mixture. Record this value.

(10) Turn off the NO_x generator O_2 (or air) supply. The analyzer will now indicate the total NO_x in the original NO in N_2 mixture. This value should be no more than 5 percent above the value indicated in step (4).

(11) Calculate the efficiency of the NOx converter by substituting the concentrations obtained into the following equation:

$$\text{Percent Efficiency} = [1 + (a-b)/(c-d)] \times 100$$

where:

a = concentration obtained in step (8).
b = concentration obtained in step (9).
c = concentration obtained in step (6).
d = concentration obtained in step (7).

The efficiency of the converter shall be greater than 90 percent. Adjustment of the converter temperature may be necessary to maximize the efficiency. If the converter does not meet the conversion-efficiency specifications, repair or replace the unit prior to testing. Repeat the procedures of this section with the repaired or new converter.

(c) *Linearity check.* For each range used, check linearity as follows:

(1) With the operating parameters adjusted to meet the converter efficiency check and the quench checks, zero the analyzer.

(2) Span the analyzer using a calibration gas that will give a response of approximately 90 percent of full-scale concentration.

(3) *Recheck the zero response.* If it has changed more than 0.5 percent of full scale, repeat steps (1) and (2).

(4) Record the response of calibration gases having nominal concentrations of 30, 60 and 90 percent of full-scale concentration. It is permitted to use additional concentrations.

(5) Perform a linear least-square regression on the data generated. Use an equation of the form $y=mx$ where x is the actual chart deflection and y is the concentration.

(6) Use the equation $z=y/m$ to find the linear chart deflection (z) for each calibration gas concentration (y).

(7) Determine the linearity (%L) for each calibration gas by:

$$\text{Percent } L = \frac{(z-x)}{\text{Full-scale linear chart deflection}} \; 100$$

(8) The linearity criterion is met if the %L is less than ±2 percent of each data point generated. For each emission test, a calibration curve of the form $y=mx$ is to be used. The slope (m) is defined for each range by the spanning process.

(9) If the %L exceeds ±2 percent for any data point generated, repair or replace the analyzer or calibration bottles prior to testing. Repeat the procedures of this section with the repaired or replaced equipment or gases.

(10) Perform a converter-efficiency check (see paragraph (b) of this section).

(11) The operating parameters are defined as "optimized" at this point.

(d) *Converter checking gas.* If the converter quick-check procedure is to be employed, paragraph (e) of this section, a converter checking gas bottle must be named. The following naming procedure must occur after each converter efficiency check, paragraph (b) of this section.

(1) A gas bottle with an NO_2 concentration equal to approximately 80 percent of the most common operation range shall be designated as the converter checking gas bottle. Its NO concentration shall be less than 25 percent of its NO_2 concentration, on a volume basis.

(2) On the most common operating range, zero and span the analyzer in the NO_x mode. Use a calibration gas with a concentration equal to approximately 80 percent of the range for spanning.

(3) Introduce the converter checking gas. Analyze and record concentrations in both the NO_x mode (X) and NO mode (Y).

(4) Calculate the concentration of the converter checking gas using the results from step (3) and the converter efficiency from paragraph (b) as follows.

$$\text{Concentration} = \frac{(X-Y) \times 100}{\text{Efficiency}} + Y$$

(e) *Converter quick-check.* (1) Span the analyzer in the normal manner (NO_x mode) for the most common operating range.

(2) Analyze the converter checking gas in the NO_x mode, record the concentration.

(3) Compare the observed concentration with the concentration assigned under the procedure in paragraph (d) of this section. If the observed concentration is equal to or greater than 90 percent of the assigned concentration, the converter operation is satisfactory.

[42 FR 45154, Sept. 8, 1977, as amended at 46 FR 50495, Oct. 13, 1981; 47 FR 49807, Nov. 2, 1982; 52 FR 47869, Dec. 16, 1987]

§ 86.333-79 Dynamometer calibration.

(a) If necessary, follow the manufacturer's instructions for initial start-up and basic operating adjustments.

(b) Check the dynamometer torque measurement for each range used by the following:

(1) Warm up the dynamometer following the equipment manufacturer's specifications.

(2) Determine the dynamometer calibration moment arm. Equipment manufacturer's data, actual measurement, or the value recorded from the previous calibration used for this subpart may be used.

(3) Calculate the indicated torque (*IT*) for each calibration weight to be used by:

IT=calibration weight (lb) x calibration moment arm (ft)

(4) Attach each calibration weight specified in § 86.312 to the moment arm at the calibration distance determined in step (2). Record the power measurement equipment response (ft-lb) to each weight.

(5) For each calibration weight, compare the torque value measured in step (4) to the calculated torque determined in step (3).

(6) The measured torque must be within 2 percent of the calculated torque.

(7) If the measured torque is not within 2 percent of the calculated torque, adjust or repair the system. Repeat steps (1) through (6) with the adjusted or repaired system.

(c) *Option.* A master load-cell or transfer standard may be used to verify the in-use torque measurement system.

(1) The master load-cell and read out system must be calibrated with weights at each test weight specified in § 86.312-79. The calibration weights must be traceable to within 0.1 percent of NBS weights.

(2) Warm up the dynamometer following the equipment manufacturer's specifications.

(3) Attach the master load-cell and loading system.

(4) Load the dynamometer to a minimum of 6 equally spaced torque values as indicated by the master load-cell for each in-use range used.

(5) The in-use torque measurement must be within 2 percent of the torque measured by the master system for each load used.

(6) If the in-use torque is not within 2 percent of the master torque, adjust or repair the system. Repeat step (2) through step (5) with the adjusted or repaired system.

(d) The dynamometer calibration must be completed within 2 hours from the completion of the dynamometer warm-up.

§ 86.334-79 Test procedure overview.

(a) The test consists of prescribed sequences of engine operating conditions to be conducted on an engine dynamometer. The exhaust gases generated during engine operation are sampled for specific component analysis through the analytical train. The test is applicable to engines equipped with catalytic or direct-flame afterburners, induction system modifications, or other systems, or to uncontrolled engines.

(b) The tests are designed to determine the brake-specific emissions of hydrocarbons, carbon monoxide, and oxides of nitrogen. The gasoline-fueled engine test consists of 1 warm-up cycle and 1 hot cycle. The Diesel engine test consists of 3 idle modes and 5 power modes at each of 2 speeds which span the typical operating range of Diesel engines. These procedures require the determination of the concentration of each pollutant, the fuel flow and the power output during each mode. The measured values are weighted and used to calculate the grams of each pollutant emitted per brake-horsepower hour.

(c)(1) When an engine is tested for exhaust emissions or is operated for service accumulation on an engine dynamometer, the complete engine shall be tested, with all emission control devices installed and functioning.

(2) Evaporative emission controls need not be connected if data are provided to show that normal operating conditions are maintained in the engine induction system.

(3) On air cooled engines, the fan shall be installed.

(4) Additional accessories (e.g., oil cooler, alternators, air compressors, etc.) may be installed with advance approval by the Administrator.

(d) All emission control systems installed on or incorporated in a new motor vehicle engine shall be functioning during all procedures in this subpart. In cases of component malfunction or failure, maintenance to correct component failure or malfunction shall be authorized in accordance with § 86.079-25.

§ 86.335-79 Gasoline-fueled engine test cycle.

(a) The following test sequence shall be followed in dynamometer operation tests of gasoline-fueled heavy-duty engines. Diesel engines are covered in § 86.336.

Cycle No.	Mode No.	Mode	Observed torque (percent of maximum observed)	Time in mode-seconds	Cumulative time-seconds	Weighting factors
1	1	Idle		60	60	0.23
1	2	Cruise	25	60	120	.07
1	3	PTA	55	60	180	.14
1	4	Cruise	25	60	240	.07
1	5	PTD	10	60	300	.05
1	6	Cruise	25	60	360	.07
1	7	FL	90	60	420	.11
1	8	Cruise	25	60	480	.07
1	9	CT		60	540	.14
2	10	Cruise	25	60	600	.07
2	11	PTA	55	60	660	.14
2	12	Cruise	25	60	720	.07
2	13	PTD	10	60	780	.05
2	14	Cruise	25	60	840	.07
2	15	FL	90	60	900	.11
2	16	Cruise	25	60	960	.07
2	17	CT		60	1,020	.14
2	18	Idle		60	1,080	.23

(b) Except for idles, the engine dynamometer shall be operated at a constant speed of 2000 rpm±100 rpm. Speed deviations, not to exceed 200 rpm, will be allowed during the first 10 seconds of each mode.

(c) The times in-mode specified in paragraph (a) for the CT modes are ±2 seconds. All other times in-mode are ±4 seconds.

(d) The first 35 seconds of each 60 second engine power mode is allowed for engine-dynamometer stabilization. After this stabilization period the torque must be held at the specified value ±5 percent until the exhaust gas analysis period. During the exhaust gas analysis period, the last 10 seconds of each nonclosed throttle mode the engine torque must be at the specified value ±2 percent of the maximum torque observed. For example, mode 3 torque shall be held between 53 and 57 percent of maximum torque (55±2 percent) during the exhaust analysis period. Prior to the analysis period but excluding the first 35 seconds of the mode, the torque shall be held between 50 and 60 percent of maximum torque (55%±5%).

(e) The idle operating mode shall be carried out at the manufacturer's recommended curb-idle engine speed. Arrive at the last idle mode by closing the throttle, braking the dynamometer to the engine idle speed, and unloading the dynamometer.

(f) The CT operating mode shall be carried out at the same engine speed as specified in paragraph (b) of this section.

(g) If the Administrator determines that an engine shall be tested as an automatic transmission code engine, then a load shall be applied by the dynamometer during the idle modes (1 and 18) such that the engine speed is decreased from the recommended dynamometer-idle speed to the recommended curb-idle speed. The engine idle torque recorded for the calculations in § 86.345 shall be zero.

(h) If the operating conditions specified in paragraph (a) of this section for modes 2 through 8, and 10 through 16 cannot be maintained, the Administrator may authorize deviations from the specified load conditions. Such deviations shall not exceed 5 percent of the maximum torque at the test speed. The minimum deviations, above and below the specified load, necessary for stable operation shall be determined by the manufacturer and approved by the Administrator prior to the test run. Emission tests shall be performed by operating the engine at the higher approved load setting during cycle 1 and at the lower approved load setting during cycle 2. The weighting factors shall be as specified in paragraph (a) of this section.

(Secs. 206, 301(a), Clean Air Act as amended (42 U.S.C. 7525, 7601(a)))

[42 FR 45154, Sept. 8, 1977, as amended at 44 FR 16917, Mar. 20, 1979; 47 FR 49813, Nov. 2, 1982]

§ 86.336–79 Diesel engine test cycle.

(a) The following 13-mode cycle shall be followed in dynamometer operation tests of heavy-duty Diesel engines. Gasoline-fueled engines are covered in § 86.335.

Test Segment	Mode No.	Engine Speed	Observed torque (percent of maximum observed)	Time in mode (minutes)		Maximum cumulative time (minutes)
				Minimum	Maximum	
1	1	Curb-idle		4.5	6.0	42
1	2	Intermediate	2	4.5	6.0	
1	3	......do	25	4.5	6.0	
1	4	......do	50	4.5	6.0	
1	5	......do	75	4.5	6.0	
1	6	......do	100	4.5	6.0	
1	7	Curb-idle		4.5	6.0	
2	8	Rated	100	4.5	6.0	36
2	9	......do	75	4.5	6.0	
2	10	......do	50	4.5	6.0	
2	11	......do	25	4.5	6.0	
2	12	......do	2	4.5	6.0	
2	13	Curb-idle		4.5	6.0	

(b) During each mode the specified speed shall be held to within 50 rpm. Torque for each mode must be held at the specified value ±2 percent of the maximum torque observed. For example, mode 4 torque shall be held between 48 and 52 percent of maximum torque (50 ±2%).

(c) If the operating conditions specified in paragraph (b) of this section for modes 3, 4, 5, 9, 10, and 11 cannot be maintained, the Administrator may authorize deviations from the specified load conditions. Such deviations shall not exceed 10 percent of the maximum torque at the test speed. The minimum deviations, above and below the specified load, necessary for stable operation shall be determined by the manufacturer and approved by the Administrator prior to the test run. Emission tests shall be performed at each of the approved load settings, one above and one below the operating conditions specified in paragraph (a) of this section. The emission values obtained shall be calculated in accordance with § 86.345 except that the weighting factor shall be 0.04.

(d) If the Administrator determines that an engine shall be tested as an automatic transmission code engine, then a load shall be applied by the dynamometer during the idle modes (1, 7, and 13) such that the engine speed is decreased from the recommended dynamometer-idle speed to the recommended curb-idle speed. The engine-idle torque recorded for the calculations in § 86.345 shall be zero.

§ 86.337-79 Information.

The following information, as applicable, shall be recorded for each test:

(a) *Engine description and specification.* A copy of the information specified in this paragraph must accompany each engine sent to the Administrator for compliance testing. The manufacturer need not record the information specified in this paragraph for each test if the information, with the exception of paragraphs (a) (3), (12), and (13), is included in the manufacturer's Part I.

(1) Engine-system combination.

(2) Engine identification numbers.

(3) Number of hours of operation accumulated on engine.

(4) Rated maximum horsepower and torque.

(5) Maximum horsepower and torque speeds.

(6) Engine displacement.

(7) Governed speed.

(8) Manufacturer's start-up and warm-up reference, (gasoline-fueled engines only).

(9) Curb-idle rpm.

(10) Dynamometer-idle rpm (automatic transmission code engines only).

(11) Maximum horsepower at 2000 rpm (gasoline-fueled engines only).

(12) Fuel consumption and maximum torque at 2000 rpm (gasoline-fueled engines only).

(13) Fuel consumption at maximum power and torque (Diesel engines only).

(14) Maximum air flow (Diesel engines only).

(15) Air inlet restriction (Diesel engines only).

(16) Exhaust pipe diameter(s) (Diesel engines only).

(17) Maximum exhaust system back pressure (Diesel engines only).

(18) Maximum exhaust system back pressure at 2000 rpm, if applicable (gasoline-fueled engines only).

(b) *Test data; general.* This information may be recorded at any time between 4 hours prior to the test and 4 hours after the test.

(1) Engine-system combination.

(2) Engine identification number.

(3) Instrument operator.

(4) Engine operator.

(5) Number of hours of operation accumulated on the engine prior to beginning the warm-up portion of the test.

(6) Fuel identification.

(7) Date of most recent analytical assembly calibration.

(8) All pertinent instrument information such as tuning, gain, serial numbers, detector number, calibration curve numbers, etc. As long as this information is traceable, it may be summarized by system number or analyzer identification numbers.

(c) *Test data; pre-test.* (1) Date and time of day.

(2) Test number.

(3) Ambient temperature in dynamometer testing room (gasoline-fueled engines only).

(4) Barometric pressure, pre-test for gasoline-fueled engines, pre-test segment for Diesel engines.

(5) Engine intake humidity, pre-test for gasoline-fueled engines, pre-test segment for Diesel engines with non-conditioned air supply systems.

(6) Maximum observed torque for intermediate and rated speeds (Diesel engines only).

(7) Maximum observed torque at 2000 rpm (gasoline-fueled engines only).

(8) *Recorder chart or equivalent.* Identify for each test (test segment for Diesel engines) zero traces for each range used, and span traces for each range used.

(d) *Test data; modal.* (1) Recorder chart or equivalent. Identify for each test mode the emission concentration traces and the associated analyzer range(s). The start and finish of each test.

(2) Observed engine torque.

(3) Observed engine rpm.

(4) Record engine torque and engine rpm continuously with a chart recorder or equivalent recording device.

(5) Intake air flow and depression for each mode (Diesel engines only).

(6) Engine intake air temperature for each mode (Diesel engines only).

(7) *Fuel flow for each mode.* If the fuel flow measurement is a volume measurement system, record the fuel

temperature in the measurement system for fuel density corrections to the mass flow rate. If the fuel temperature is within 3° C (5.4° F) of the calibration temperature, no density correction is required.

(8) Engine intake humidity (only for Diesel engines with humidity conditioned air supply).

(e) *Test data; post-test.* (1) Recorder chart or equivalent. Identify the hang-up check.

(2) *Recorder chart or equivalent.* Identify the zero traces for each range used and the span traces for each range used.

(3) Ambient temperature in the dynamometer testing room (gasoline-fueled engines only).

(4) Total number of hours of operation accumulated on the engine.

[42 FR 45154, Sept. 8, 1977, as amended at 46 FR 50495, Oct. 13, 1981; 47 FR 49807, Nov. 2, 1982]

§ 86.338-79 Exhaust measurement accuracy.

(a) The analyzers must be operated between 15 percent and 100 percent of full-scale chart deflection during the measurement of the emissions for each mode. The exceptions to the lower limit of this operating rule are:

(1) The analyzer's response may be less than 15 percent of full-scale if the full-scale value is 155 ppm (or ppm C) or less.

(2) *Option.* For CO analysis the analyzer's response may be less than 15 percent of full scale if the full-scale value is 5500 ppm or less.

(3) The analyzer's response may be less than 15 percent of full scale if the emissions from the engine are erratic and the average chart-deflection value is greater than 15 percent of full scale.

(4) For gasoline-fueled engines, the analyzer's response may be less than 15 percent of full scale during the initial part of the CT mode provided that average chart-deflection value is greater than 15 percent of full scale.

(5) The analyzer's response may be less than 15 percent of full scale if the contribution of all modes read below the 15 percent level is less than 10 percent by mass of the final test results.

(6) The HC analyzer's response may be less than 15 percent of full-scale when transient emissions (spikes) can be reasonably expected to exceed 90 percent of full-scale. Higher analyzer ranges may be used provided that the precision and linearity of the anlyzer at the level of the readings below 15 percent meets the specifications of the range that would be required if the transient emissions did not exist.

(Secs. 206, 301(a), Clean Air Act as amended (42 U.S.C. 7525, 7601(a)))

[42 FR 45154, Sept. 8, 1977, as amended at 44 FR 13917, Mar. 20, 1979; 46 FR 50495, Oct. 13, 1981, and 47 FR 49807, Nov. 2, 1982]

§ 86.339-79 Pre-test procedures.

(a) Allow a minimum of 30 minutes warm-up in the stand-by or operating mode prior to spanning the analyzers.

(b) Replace or clean the filter elements and then vacuum leak check the system, § 86.328(a). A pressure leak check is also permitted per § 86.328(b). Allow the heated sample line, filters, and pumps to reach operating temperature.

(c) Perform the following system checks:

(1) If a stainless steel NO_2 to NO converter is used, prior to gasoline-fueled engine tests, purge the converter with air (zero-grade air, room air, or O_2) for a minimum of 30 minutes. The converter must be at operational temperature while purging.

(2) Check the sample-line temperature (see § 86.310).

(3) Check the system response time (see § 86.329). System response time may be applied from the most recent check of response time if all of the following are met:

(i) The flow rate for each flow meter is equal to or greater than the flow rate recorded in § 86.329(b)(1)(ii).

(ii) For analyzers with capillaries, the response time from the sample/span valve is measured using in-use pressures and bypass flows (see § 86.329(b)(2)).

(iii) The response time measured in step (ii) is equal to or less than the response time determined in § 86.329(b)(2)(vii).

(4) A hang-up check is permitted.

(5) A converter-efficiency check is permitted. The check need not conform to § 86.332(b). The test procedure

may be aborted at this point in the procedure in order to repair the NO_2 to NO converter. If the test is aborted, the converter must pass the efficiency check described in § 86.332(b) prior to starting the dynamometer test run.

(d) Introduce the zero-grade gases at the same flow rates and pressures used to calibrate the analyzers and zero the analyzers on the lowest anticipated range that will be used during the test. Immediately prior to each test (segment, for Diesel engines), obtain a stable zero for each anticipated range that will be used during the test.

(e) Introduce span gases to the instruments under the same flow conditions as were used for the zero gases. Adjust the instrument gains on the lowest range that will be used to give the desired value. Span gases should have a concentration greater than 70 percent of full scale for each range used. Immediately prior to each test and also prior to each segment of the Diesel test, record the response to the span gas and the span-gas concentration for each range that will be used during the test.

(f) *Check the zero responses.* If they have changed more than 0.5 percent of full scale, repeat paragraphs (d) and (e) of this section.

(g) Check system flow rates and pressures. Note the values of gauges G3 and G4 for reference during the test.

§ 86.340-79 Gasoline-fueled engine dynamometer test run.

(a) This section applies to gasoline-fueled engines only. Diesel engines are covered in § 86.341.

(b) (1) Mount test engine on the engine dynamometer.

(2) Install instrumentation and sample probe.

(3) Read and record the general test data as specified in § 86.337(b).

(c) Precondition the engine by the following continuous steps:

(1) The engine shall be started and operated at:

(i) Zero load in accordance with the manufacturer's start-up and warm-up procedures for 1 minute ±30 sec;

(ii) A torque equivalent to 10±3 percent of the most recent determination of maximum torque for 4 minutes ±30 second at 2,000 rpm. This torque level may be exceeded if the choke and fast idle cam mechanism would normally result in a stabilized idle speed in excess of 2,000 rpm.

(iii) A torque equivalent to 55±5 percent of the most recent determination of maximum torque for 35 minutes ±1 minute at 2000 rpm;

(iv) *Option.* If the engine has been operating on service accumulation for a minimum of 40 minutes, the service accumulation may be substituted for steps (i) through (iii).

(2) If tested under the provisions of § 86.079-29, check specifications as required. This check must be performed within 20 minutes after completion of engine preconditioning;

(3) Determine the maximum torque of the engine at 2000 rpm ±100 rpm;

(i) Operate the engine with the throttle fully opened for a maximum of three minutes. During the second minute of operation, record the high and low torque readings. The average of these two readings will be the maximum torque value at 2000 rpm.

(ii) Calculate the torque corresponding to 10, 25, 55, and 90 percent of the observed maximum torque value.

(4) Determine the analyzer ranges required for each mode specified in § 86.335 to meet the range specifications of § 86.338. Prior to determining the range selection, the automatic dynamometer controller, if used, may be calibrated for the prevailing ambient conditions. The engine must not be operated for more than 30 minutes. Cycle 1, or cycles 1 and 2, specified in § 86.335, may be used for this purpose.

(5) The engine shall be turned off and allowed to stand for at least 1 hour, but not more than 2 hours, at an average ambient temperature of 25° C±5° C (77° F±9° F).

(d) The following steps shall be taken for each test:

(1) Maintain dynamometer test cell average ambient temperature at 25° C±5° C (77° F±9° F);

(2) Observe pre-test procedures § 86.339;

(3) Start cooling system;

(4) Start engine and operate in accordance with manufacturer's start-up and warm-up procedures. The duration of the warm-up procedures shall

be 5 minutes ±30 seconds. Sample flow may begin during the warm-up;

(5) Read and record all pre-test data specified in § 86.337(c) during the 5 minute warm-up;

(6) Release the choke idle-stop (if necessary) and return the engine throttle control to the curb-idle position, start sample flow and recorders if not already started, and begin test sequence of § 86.335;

(7) Should it be determined that the test must be rerun, then only the soak specified in paragraph (c)(5) of this section need be performed prior to paragraph (d) of this section;

(8) Perform the test cycle, § 86.335, and continuously record exhaust gas concentrations;

(9) Read and record all modal data specified in § 86.337(d) during the test cycle;

(10) The engine speed and load must be maintained within the requirements of § 86.343;

(11) If at any time during a test, the test equipment malfunctions or the specifications in paragraph (d)(10) of this section are not met, the test is void, and may be aborted. The test sequence may be restarted under the provisions of paragraph (c)(5) of this section.

(e) *Exhaust gas measurements.* (1) Measure HC, CO, CO_2, and NO_x volume concentration in the exhaust sample. Should the analyzer response exceed 100 percent of full scale or respond less than 15 percent of the full scale, the next higher or lower analyzer range shall be used per § 86.338. For exceptions to the lower limit see § 86.338. Should the fuel flow instrument read below 20 percent of the full-scale value, a flow measurement unit with a lower scale must be used unless the option in § 86.314 is desired.

(2) For each analyzer, each range that may be used during a test must have the zero and span responses recorded prior to the execution of that test. Only the range(s) used to measure the emissions during a test are required to have their zero and span recorded after the completion of the test.

(3) If during an emission test the value of gauges downstream of the NDIR analyzer(s) (G3 or G4) differs by more than ±2 inches of water from the pretest value, the test is void.

(Secs. 206, 301(a), Clean Air Act as amended (42 U.S.C. 7525, 7601(a)))

[42 FR 45154, Sept. 8, 1977, as amended at 44 FR 16917, Mar. 20, 1979; 46 FR 50496, Oct. 13, 1981; 47 FR 49807, 49813, Nov. 2, 1982]

§ 86.341-79 Diesel engine dynamometer test run.

(a) This section applies to Diesel engines only. Gasoline-fueled engines are covered in § 86.340.

(b) The temperature of the air supplied to the engine shall be between 68°F and 86°F. The fuel temperature at the pump inlet shall be 100°F±10°F. The observed barometric pressure shall be between 28.5 inches and 31 inches Hg. Higher air temperature or lower barometric pressure may be used, if desired, but no allowance shall be made for increased emissions because of such conditions unless correction factors are developed and approved in advance by the Administrator.

(c) The governor and fuel system shall have been adjusted to provide engine performance at the levels in the application for certification required under § 86.079-21. These adjustments are only permitted under the provisions of § 86.079-25.

(d) The following steps shall be taken for each test:

(1) Install instrumentation and sample probes as required;

(2) Observe pre-test procedure, § 86.339;

(3) Read and record the general test data as specified in § 86.337(b);

(4) Start cooling system;

(5) Precondition the engine in the following manner:

(i) Operate the engine at idle for 2 to 3 minutes;

(ii) Operate the engine at approximately 50 percent power at the peak torque speed for 5 to 7 minutes;

(iii) Operate the engine at rated speed and maximum horsepower for 25 to 30 minutes;

(iv) *Option.* It is permitted to precondition the engine at rated speed and maximum horsepower until the oil and water temperatures are stabilized. The temperatures are defined as stabilized if they are maintained within 2 percent of point for 2 minutes. The engine must be operated a minimum of 10 minutes for this option. This optional procedure may be substituted for step (iii);

(v) *Option.* If the engine has been operating on service accumulation for a minimum of 40 minutes, the service accumulation may be substituted for steps (i) through (iii);

(vi) Longer preconditioning times may be used only if prior approval is obtained from the Administrator.

(6) Within a total elapsed time of 10 minutes or less, determine by experimentation the maximum torque at the rated and intermediate speeds;

(7) Calculate the torque corresponding to 2, 25, 50, 75, and 100 percent of the maximum observed torque for the rated and intermediate speeds;

(8) Read and record all pre-test data specified in § 86.337(c);

(9) Start the test cycle, § 86.336, within 10 minutes, after determining test load using the torque values determined in paragraph (d)(6) of this section;

(10) Read and record all modal data specified in § 86.337(d) during the last 2 minutes of each mode;

(11) Continuously record the analyzer's response to the exhaust gas during each test segment;

(12) Test segments may be repeated;

(13) If a delay of more than 20 minutes occurs between the end of one segment and the beginning of another segment the test is void. The test may be restarted at paragraph (d)(8) of this section. If the delay exceeds 4 hours, the test shall be restarted at paragraph (d) (2) of this section;

(14) The engine speed and load must be maintained within the requirements of § 86.336 during the last 2 minutes of each mode. If the requirement is not met for all modes during a test segment, that segment of the test is void. The test segment may be restarted beginning with paragraph (d)(8) of this section;

(15) If at any time during a test segment, the test equipment malfunctions or the specifications in paragraph (d)(14) of this section are not met, the test segment is void, and may be aborted. The test segment may be restarted beginning with paragraph (d)(8) of this section;

(16) Fuel flow and air flow during the idle or 2-percent load conditions may be determined just prior to or immediately following the dynamometer sequence, if longer times are required for accurate measurements.

(e) *Exhaust gas measurements.* (1) Measure HC, CO, CO_2, and NO volume concentration in the exhaust sample. Should the analyzer response exceed 100 percent of full scale or respond less than 15 percent of full scale, the next higher or lower analyzer range shall be used per § 86.338. For exceptions to the lower limit see § 86.338. Should the fuel flow instrument read below 20 percent of full scale value, a smaller flow measurement unit must be used unless the option in § 86.314 is desired.

(2) Each analyzer range that may be used during a test segment must have the zero and span responses recorded prior to the execution of that test segment. Only the range(s) used to measure the emissions during a test segment are required to have their zero and span recorded after the completion of the test segment.

(3) It is permitted to change filter elements between test segments.

(4) A leak check is permitted between test segments.

(5) A hang-up check is permitted between test segments.

(6) If, during the emission measurement portion of a test segment, the value of the gauges downstream of the NDIR analyzer(s) G3 or G4 differs by more than ±2 inches of water from the pretest value, the test segment is void.

[42 FR 45154, Sept. 8, 1977, as amended at 46 FR 50496, Oct. 13, 1981, and 47 FR Nov. 2, 1982]

§ 86.342-79 Post-test procedures.

(a) Begin a hang-up check within seconds of the completion of the last mode in the test. Use the following procedure:

(1) Introduce a zero-grade gas or room air into the sample probe or valve V2 to check the "hangup zero

response. Simultaneously start a time measurement.

(2) Select the lowest HC range used during the test;

(3) The difference between the span-zero response and the hang-up zero response shall not be greater than 5.0 percent of full scale or 10 ppmC whichever is greater, within:

(i) 50 seconds for gasoline-fueled engine test, or

(ii) 4 minutes for Diesel engine tests, or

(b) Begin the analyzer span checks within 6 minutes after the completion of the last mode in the test. Record for each analyzer the zero and span response for each range used during the preceding test or test segment.

(c) If during the test, the filter element(s) were replaced or cleaned, a vacuum check must be performed per § 86.328 immediately after the span checks. If the vacuum side leak check does not meet the requirements of § 86.328 the test is void.

(d) Read and record the post-test data specified in § 86.337(e).

(e) For a valid test, the analyzer drift between the before-test and after-test (before-segment and after-segment for Diesels) span checks for each analyzer must meet the following requirements:

(1) The span drift (defined as the change in the difference between the zero response and the span response) must not exceed 2.0 percent of full-scale chart deflection for each range used;

(2) The zero response drift must not exceed 2.0 percent of full-scale chart deflection for each range used above 155 ppm (or ppm C), or 3 percent of full-scale chart deflection for each range below 155 ppm (or ppm C).

(Secs. 206, 301(a), Clean Air Act as amended (42 U.S.C. 7525, 7601(a)))

[42 FR 45154, Sept. 8, 1977, as amended at 44 FR 16917, Mar. 20, 1979; 46 FR 50496, Oct. 13, 1981; 47 FR 49807, Nov. 2, 1982]

§ 86.343–79 Chart reading.

(a) A computer or any other automatic data processing device(s) may be used as long as the system meets the requirements of this subpart.

(b) Determine the location on the chart of the analyzer responses corresponding to the end of each mode.

(c) For gasoline-fueled engines, determine whether the test cycle was run in accordance with § 86.335 by observing either chart event marks, speed trace, torque trace, or concentration traces. The test will be invalidated if there is a deviation of more than:

(1) 2 seconds from the specified time for each CT mode, and 4 seconds for all other modes; or,

(2) Two percent of maximum torque during the exhaust gas sampling period (last 10 seconds on each non-closed throttle gasoline-fueled engine mode); or

(3) 5 percent of maximum torque during the remainder of the mode, excluding the first 35 seconds of the mode; or

(4) 200 rpm during the first 10 seconds of each mode, or 100 rpm during the remainder of each mode.

(d) Determine chart deflections.

(1) Locate the last 10 seconds of each gasoline-fueled engine mode except CT. Locate the last 50 seconds of each gasoline-fueled engine CT mode. For all Diesel engine modes locate the last 60 seconds.

(2)(i) Divide the last 10 seconds or 60 seconds, whichever is applicable, into a minimum of 10 equally spaced increments. Determine the chart deflection of each increment for the CO_2, CO, HC, and NO_x analyzers.

(ii) Option for Diesel engine modes. If the deviation from a straight line (other than instrument noise) during this 60 seconds is less than ±5 percent of full-scale, the average chart deflection may be determined by eye. The average value (one number) may then be used in lieu of the 10 values required by paragraph (d)(2)(i) of this section.

(3) Other methods of determining the chart deflection of the analyzers may be used only with prior approval by the Administrator.

(e) Determine CO_2, CO, HC, and NO_x concentrations for each mode.

(1) If the option in paragraph (d)(2)(ii) of this section is employed, then those chart deflections for both linear and non-linear analyzers may be

substituted for the average chart deflection in step (e)(2).

(2) For linear instruments, average the chart deflections determined in paragraph (d)(2)(i) of this section. Determine the concentration for this average chart deflection using calibration data.

(3) For non-linear instruments, calculate concentrations for each chart deflection determined in paragraph (d)(2)(i) of this section. Take the average of these concentrations for each mode.

(4) For purposes of this paragraph, calibration data includes calibration curves, linearity curves, span-gas responses, and zero-gas responses.

[42 FR 45154, Sept. 8, 1977, as amended at 47 FR 49813, Nov. 2, 1982]

§ 86.344-79 Humidity calculations.

(a) The following abbreviations (and units) are used in this section:

$BARO$=barometric pressure (Pa)
H=specific humidity, (gm H_2O/gm of dry air)
K=0.6220 gm H_2O/gm dry air
M_{air}=Molecular weight of air=28.9645
M_{H_2O}=Molecular weight of water=18.01534
P_{DB}=Saturation vapor pressure of water at the dry bulb temperature (Pa)
P_{DP}=saturation vapor pressure of water at the dewpoint temperature (Pa)
P_v=partial pressure of water vapor (Pa)
P_{WB}=saturation vapor pressure of water at the wet bulb temperature (pa)
T_{DB}=Dry bulb temperature (°K)
T_{WB}=Wet bulb temperature (°K)
Y=Water-vapor volume concentration

(b) The specific humidity on a dry basis of the intake air (H) is defined by equation (1).

$$H = \frac{(K)(P_v)}{BARO - P_v} \qquad (1)$$

(c) The partial pressure of water vapor may be determined in two manners:

(1) A dew point device may be used. In that case:

$$P_v = P_{DP}$$

(2) A wet-bulb, dry-bulb method may be used. In that case "Ferrels equation" (eq. (2)) is used.

$$P_v = P_{WB} - 0.000660\,(T_{DB} - T_{WB})BARO[1 + 0.00115(T_{WB} - 273.15)] \qquad (2)$$

(d) (1) The saturation vapor pressure (P_{WB}) of water at the wet-bulb temperature is defined by equation (3) (Ref. Wexler and Greenspan, equation (23), National Bureau of Standards).

$$P_{WB} = \exp\left[B \ln T_{WB} + \sum_{i=0}^{9} F_i T_{WB}^{i-2}\right] \qquad (3)$$

where:
P_{WB} is in Pascals (Pa)
T_{WB}=Web-bulb temperature (°K)
$B = -12.150799$
$F_0 = -8.49922(10)^{3}$
$F_1 = -7.4231865(10)^{3}$
$F_2 = 96.1635147$
$F_3 = 2.4917646(10)^{-2}$
$F_4 = -1.3160119(10)^{-5}$
$F_5 = -1.1460454(10)^{-8}$
$F_6 = 2.1701289(10)^{-11}$
$F_7 = -3.610258(10)^{-15}$
$F_8 = 3.8504519(10)^{-18}$
$F_9 = -1.4317(10)^{-21}$

(2) The table in Figure D79-5 may be used in lieu of equation (3).

(e) The saturated vapor pressure of water at the dry-bulb temperature (P_{DB}) is found (if required) by using dry-bulb absolute temperature (°K) in equation (3).

(f) The percent of relative humidity (RH) (if required) is defined by equation (4).

$$RH = \frac{P_v}{P_{DB}}\,(100) \qquad (4)$$

(g) The water-vapor volume concentration on a dry basis of the engine intake air (Y) is defined by equation (5).

$$(5)\qquad Y = \frac{(H)(M_{air})}{(M_{H2O})} = \frac{P_{r}}{BARO - P_{r}}$$

FIGURE D79-5—SATURATION VAPOR PRESSURE OVER WATER (PASCALS)

Temperature ° C	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0	610.752	615.207	619.690	624.203	628.744	633.315	637.916	642.545	647.205	651.884
1	656.614	661.364	666.144	670.955	675.796	680.669	685.572	690.507	695.473	700.471
2	705.500	710.562	715.655	720.781	725.939	731.130	736.354	741.611	746.901	752.224
3	757.581	762.971	768.396	773.854	779.347	784.874	790.436	796.033	801.664	807.331
4	813.034	818.771	824.545	830.355	836.200	842.082	848.001	853.956	859.948	865.978
5	872.045	878.149	884.291	890.470	896.688	902.945	909.239	915.573	921.945	928.357
6	934.808	941.298	947.828	954.399	961.009	967.660	974.351	981.083	987.856	994.670
7	1001.53	1008.42	1015.36	1022.34	1029.37	1036.43	1043.54	1050.70	1057.89	1065.13
8	1072.41	1079.74	1087.11	1094.52	1101.98	1109.48	1117.03	1124.63	1132.27	1139.95
9	1147.68	1155.46	1163.28	1171.15	1179.07	1187.04	1195.05	1203.11	1211.21	1219.37
10	1227.57	1235.83	1244.13	1252.48	1260.88	1269.32	1277.82	1286.37	1294.97	1303.62
11	1312.32	1321.07	1329.87	1338.73	1347.63	1356.59	1365.60	1374.67	1383.78	1392.95
12	1402.17	1411.45	1420.78	1430.16	1439.60	1449.10	1458.64	1468.25	1477.91	1487.62
13	1497.39	1507.22	1517.11	1527.05	1537.04	1547.10	1557.21	1567.39	1577.62	1587.90
14	1598.25	1608.66	1619.12	1629.65	1640.24	1650.88	1661.59	1672.36	1683.18	1694.08
15	1705.03	1716.04	1727.12	1738.26	1749.46	1760.73	1772.06	1783.45	1794.91	1806.43
16	1818.01	1829.67	1841.38	1853.17	1865.02	1876.93	1888.91	1900.96	1913.08	1925.27
17	1937.52	1949.84	1962.23	1974.69	1987.21	1999.81	2012.48	2025.21	2038.02	2050.90
18	2063.85	2076.87	2089.97	2103.13	2116.37	2129.68	2143.07	2156.53	2170.06	2183.66
19	2197.34	2211.10	2224.93	2238.84	2252.82	2266.88	2281.02	2295.23	2309.52	2323.89
20	2338.34	2352.86	2367.47	2382.15	2396.91	2411.76	2426.68	2441.68	2456.77	2471.93
21	2487.18	2502.51	2517.93	2533.42	2549.00	2564.66	2580.41	2596.24	2612.16	2628.16
22	2644.25	2660.42	2676.68	2693.02	2709.46	2725.98	2742.59	2759.28	2776.07	2792.94
23	2809.91	2826.96	2844.11	2861.34	2878.67	2896.09	2913.60	2931.20	2948.89	2966.68
24	2984.56	3002.54	3020.61	3038.77	3057.03	3075.39	3093.84	3112.39	3131.03	3149.78
25	3168.62	3187.55	3206.59	3225.73	3244.96	3264.30	3283.73	3303.27	3322.91	3242.65
26	3362.49	3382.43	3402.48	3422.63	3442.89	3463.24	3483.71	3504.28	3524.95	3545.73
27	3566.62	3587.62	3608.72	3629.93	3651.25	3672.67	3694.21	3715.86	3737.61	3759.48
28	3781.46	3803.55	3825.75	3848.07	3870.50	3893.04	3915.70	3938.47	3961.36	3984.36
29	4007.48	4030.71	4054.06	4077.53	4101.12	4124.83	4148.65	4172.59	4196.66	4220.84
30	4245.15	4269.58	4294.13	4318.80	4343.60	4368.52	4393.56	4418.73	4444.02	4469.44

§ 86.345-79 Emission calculations.

(a) The following abbreviations (and units) are used in this section.

α=atomic hydrogen/carbon ratio of the fuel
ϕ=dry fuel-air ratio (measured)/fuel-air ratio (stoichiometric)
BARO=Barometric pressure (in. *HgA*)
BHP=Brake horsepower
BSCO=Brake specific carbon monoxide emissions, (gm/*BHP-HR*)
BSFC=Brake specific fuel consumption (lb/*BHP-HR*)
BSHC=Brake specific hydrocarbon emissions (gm/*BHP-HR*)
$BSNO_x$=Brake specific oxides of nitrogen emissions (gm/*BHP-HR*)
DCO=CO volume concentration in exhaust, ppm (dry)
DCO_2=CO_2 volume concentration in exhaust, percent (dry)
DHC=HC volume carbon concentration in exhaust, ppmC (dry)
DKNO=NO volume concentration in exhaust, in ppm (dry and humidity corrected)
EIP=engine intake pressure (in. *HgA*)=*BARO*‘inlet depression
f/a=measured dry fuel-air ratio
G=humidity of the inlet air in grains of water per pound of dry air=(453.59/0.0648) *H*, (see § 86.344)
K=water‘gas equilibrium constant=3.5
K_{NOx}= Humidity correction factor for oxides of nitrogen
K_w=Wet to dry correction factor
M_C=Atomic weight of carbon
(M_C+M_H)=mean molecular weight of the fuel per carbon atom
M_{CO}=Molecular weight of CO
M_F=Mass flow-rate of fuel used in the engine in lb/hr=W_f/453.59
M_H=Atomic weight of hydrogen

M_{NO_2}=Molecular weight of nitrogen dioxide (NO_2)

T=Temperature of inlet air (°F)

W_{CO}=Mass rate of CO in exhaust, grams/hr

W_f=Mass flow-rate of fuel used in the engine, in grams/hr=(453.59) x (W_f lbs/hr)

WHC=HC volume concentration in exhaust, ppm C(wet)

W_{HC}=Mass rate of HC in exhaust, grams/hr

W_{NO_x}=Mass rate of NO_x in exhaust, grams/hr

Y=H_2O volume concentration of intake air (See § 86.344)

(b) Determine the exhaust species volume concentration for each mode.

(c)(1) Convert wet basis measurements to a dry basis by the following:

Dry concentrations=1/K_w x wet concentrations. K^w is defined by the equation in Figure D79-6.

(2) For Diesel engines, for each mode use the measured engine (*f/a*) entering the combustion chamber when calculating ϕ. If applicable bleed air, etc. must be subtracted from the measured air flow (see § 86.313).

(3) For gasoline-fueled engines, optional for Diesel engines, calculate ϕ for each mode by substituting WHC for *DHC* in the (*f/a*) equations paragraph (d) of this section.

(4) Calculate a *Y* value for each gas-oline-fueled engine test from the pre-test data. Apply the *Y* value to the K equation for the entire test.

(5) Calculate a separate *Y* value for each Diesel test segment from the pre-test-segment data. Apply the *Y* value to the K_w equation for the entire test-segment.

$$K_W = \frac{1}{1+\left[\dfrac{\alpha\left(\dfrac{DCO_2}{10^2}+\dfrac{DCO}{10^6}\right)+\dfrac{2Y}{\phi}\left(\dfrac{DCO_2}{10^2}+\dfrac{DCO}{10^6}+\dfrac{WHC}{10^6}\right)\left(1+\dfrac{\alpha}{4}\right)}{2\left(1+\dfrac{\frac{DCO}{10^6}}{\left(\frac{DCO_2}{10^2}\right)K}\right)}\right]}$$

Figure D79-6 K_W - WET TO DRY CORRECTION FACT

(d) Compute the dry (*f/a*) if required as follows:

$$(f/a)=\frac{4.77\ (1+\alpha/4)\ (f/a)\ \text{stoich}}{\dfrac{1}{X}-\left(\dfrac{DCO}{2X(10)^6}\right)-\left(\dfrac{DHC}{X\,10^6}\right)+\dfrac{\alpha}{4}\left(1-\dfrac{DHC}{X(10^6)}\right)-\dfrac{.75\alpha}{\left(\dfrac{K}{\dfrac{DCO}{X(10)^6}}\right)+\left(\dfrac{(1-K)}{1-\dfrac{DHC}{X(10)^6}}\right)}}$$

$$(f/a)\ \text{stoich}=\frac{M_C+\alpha M_H}{138.18\ (1+\alpha/4)}$$

where

$$X=DCO_2/10^2+DCO/10^6+DHC/10^6$$

(e) *Data validation*—(1) *Diesel engines only.* Compare the calculated dry (*f/a*) with the measured fuel and air flow. For a valid test the emission calculated (*f/a*) must agree within 10 percent of the measured (*f/a*) for each mode. Diesel engine idle and 2 percent modes do not have to meet this requirement.

(2) *Fuel/Air ratio comparison.* When comparing measured (*f/a*) ratio to an emissions calculated (*f/a*) ratio, the measured air flow (in terms of mass) is the total mass of air entering the exhaust pipe. This may include additions of air mass to the exhaust pipe by a air injection system.

(3) Other methods of data validation may be used if prior approval is ob-tained from the Administrator.

(4) Data validation techniques th have obtained prior approval from the Administrator for use on gasoline fueled engines may be used to determine void tests.

(f) Multiply the dry nitric oxid volume concentrations by the follow-ing humidity correction factor obtain *DKNO*:

(1) Gasoline-fueled engines:

$K_{NOx} = 0.6272 + 0.00629G - 0.0000176G^2$

(2) Diesel engines:

$$K_{NOx} = \frac{1}{1 + A(G - 75) + B(T - 85)}$$

where:

$A = 0.044\ (f/a) - 0.0038$

$B = -0.116(f/a) + 0.0053$

T = Temperature of inlet air, °F.

(g) Calculate the mass emissions of each species in grams per hour for each mode as follows:

(1) $$\text{HC grams/hr} = W_{HC} = \frac{(DHC/10^4)W_f}{(DCO/10^4) + DCO_2 + (DHC/10^4)}$$

(2) $$\text{CO grams/hr} = W_{CO} = \frac{M_{CO}(DCO/10^4)W_f}{(M_C + {}_{\alpha}M_H)[(DCO/10^4) - DCO_2 + (DHC/10^4)]}$$

(3) $$\text{NO}_x \text{ grams/hr} = W_{NOx} = \frac{M_{NO2}(DKNO/10^4)W_f}{(M_C + {}_{\alpha}M_H)[(DCO/10^4) + DCO_2 + (DHC/10^4)]}$$

(h)(1) For gasoline-fueled engines, weight the mass values of *BHIP*, W_{HC}, W_{CO}, M_f, and W_{NO_x} for each mode by multiplying the modal mass values by the appropriate modal weighting factor prescribed by § 86.335.

(2) For Diesel engines, weight the values of *BHP*, W_{HC}, W_{CO}, W_{NO_x}, and M_f as follows:

(i) Weight the values from each idle mode by multiplying the values by (0.067);

(ii) Weight the remaining modes by multiplying the values by 0.08.

(i) Calculate the brake specific emissions for:

(1) Each gasoline-fueled engine test cycle, and

(2) Each Diesel engine test by summing the weighted values (*BHP*, W_{HC}, W_{CO}, and W_{NO_x}) from each mode as follows:

$$BSHC\,(t) = \frac{\Sigma \text{ weighted } W_{HC}}{\Sigma \text{ weighted } BHP}$$

$$BSCO\,(t) = \frac{\Sigma \text{ weighted } W_{CO}}{\Sigma \text{ weighted } BHP}$$

$$BSNOx\,(t) = \frac{\Sigma \text{ weighted } W_{NOx}}{\Sigma \text{ weighted } BHP}$$

(t) = Test cycle number (t = 1, 2) (gasoline-fueled engines only).

(j)(1) Calculate the brake-specific fuel consumption (*BSFC*) from the nonweighted *BHP* and *Mf* for each mode. Gasoline-fueled engine idle and *CT* modes, and Diesel idle modes are excluded.

(2) For gasoline-fuel engines use:

$$BSFC = \frac{M_f}{BHP}$$

(3) For Diesel engines use:

$$CBSFC = \frac{M_f}{CBHP}$$

where:

$$CBHP = BHP \left[\frac{29.00}{EIP}\right]\left[\frac{T + 459.69}{85 + 459.69}\right]^{0.7}$$

(4) Other methods of correcting power to determine *BSFC* may be used only with prior approval of the Administrator.

(k) Calculate the weighted brake-specific fuel consumption (*WBSFC*) for

(1) Each gasoline engine test cycle by:

$$WBSFC(t) = \frac{\Sigma \text{weighted} M_f}{}$$

$$\Sigma \text{weighted} BHP$$

where:
t=Test cycle number (t=1,2)

(2) Each Diesel engine test by:

$$WCBSFC = \frac{\Sigma \text{weighted} M_f}{\Sigma \text{weighted} CBHP}$$

(l) For gasoline-fueled engines, calculate the brake-specific emissions and fuel consumption for the complete test as follows:

$BSHC(T) = 0.35\ BSHC(1) + 0.65\ BSHC(2)$
$BSCO(T) = 0.35\ BSCO(1) + 0.65\ BSCO(2)$
$BSNO_x(T) = 0.35\ BSNO_x(1) + 0.65\ BSNO_x(2)$
$WBSFC(T) = 0.35\ WBSFC(1) + 0.65\ WBSFC(2)$

§ 86.346-79 Alternative NO_x measurement technique.

(a) Oxides of nitrogen (NO_x) may be measured with the following "alternative instrumentation" for both Diesel and gasoline-fueled engines. The "alternative instrumentation" shall consist of:

(1) A heated sample line maintained above the dew point:

(2) An NO_2 to NO converter obtaining a sample directly from the heated sample line; and

(3) A combination per 40 CFR 86.777 or 40 CFR 86.977, whichever is applicable of a water trap, dryer, flow controls, and an NO NDIR analyzer obtaining a sample from the converter.

(b) The provisions of 40 CFR 86 Subpart D shall apply to the "alternative instrumentation", where applicable, with the following exceptions:

(1) Analyzer specifications found in §§ 86.315, 86.321, and 86.322 do not apply to the "alternative instrumentation".

(2) For the purposes of this section, the full-scale value specified in § 86.338 (a)(1) shall be 1,500 ppm for Diesel engines and 2,500 ppm for gasoline-fueled engines.

(c) The "alternative instrumentation" shall be calibrated per § 86.330.

(d) The NO NDIR analyzer shall meet the performance and interference specifications contained in 40 CFR 86.777 or 40 CFR 86.977, whichever is applicable.

(e) The operation of the dryer shal follow good engineering practice suc that the test results are not altere Proper preconditioning of the dryer i allowed.

§ 86.347-79 Alternative calculations fo diesel engines.

(a) *This section applies to Diesel en gines only.* Gasoline-fueled engine must use the calculations in § 86.345

(b) For Diesel engines, the calcula tions specified in 40 CFR 86.977-1 may be substituted for § 86.345.

(c) The modal *BSFC* and weighte *BSFC* shall be calculated per § 86.34

(d) If the provisions of this sectio are used, a CO_2 measurement is not re quired.

(e) Both 40 CFR 86.977-15(a) an § 86.313 shall apply to air-flow mea urements. For the purposes of this se tion, the air-flow measurement accura cy specified in § 86.313 shall be ±1 pe cent.

§ 86.348-79 Alternative to fuel H/C ana sis.

(a) Fuel H/C analysis need not b performed if the following average H C ratios are used for all calculations

(1) #1 Diesel: 1:93

(2) #2 Diesel: 1:80

(3) Gasoline: 1.85

[46 FR 50496, Oct. 13, 1981, and 47 F 49807, Nov. 2, 1982]

Subpart E—Emission Regulations fo 1978 and Later New Motorcycle General Provisions

SOURCE: 42 FR 1126, Jan. 5, 1977, unle otherwise noted.

§ 86.401-78 General applicability.

(a) This subpart applies to 1978 an later model year, new gasoline-fuele motorcycles built after 31 Decembe 1977.

(b) Motorcycles with engine di placements less than 50 cc (3.1 cu. in are excluded from the requirements o this subpart.

(c) A motorcycle is excluded fro the requirements of this subpart. i with an 80 kg (176 lb) driver, it canno

(1) Start from a dead stop using onl the engine, or

(2) Exceed a maximum speed of 40 km/h (24.9 mph) level paved surfaces.

§ 86.401-90 General applicability.

(a) This subpart applies to 1978 and later model year, new, gasoline-fueled motorcycles built after December 31, 1977, and to 1990 and later model year, new, methanol-fueled motorcycles built after December 31, 1989.

(b) Motorcycles with engine displacements less than 50 cc (3.1 cu in) are excluded from the requirements of this subpart.

(c) Motorcycles are excluded from the requirements of this subpart, if with an 80 kg (176 lb) driver, it cannot:

(1) Start from a dead stop using only the engine, or

(2) Exceed a maximum speed of 40 km/h (25 mph) on level paved surfaces.

[54 FR 14539, Apr. 11, 1989]

§ 86.402-78 Definitions.

(a) The definitions in this section apply to this subpart and also to Subpart F.

"Act" means Part A of title II of the Clean Air Act, 42 U.S.C. 1857 f-1 through f-7, as amended by Pub. L. 91-604.

"Administrator" means the Administrator of the Environmental Protection Agency or his authorized representative.

"Class", see § 86.419.

"Crankcase emissions" means airborne substances emitted to the atmosphere from any portion of the engine crankcase ventilation or lubrication systems.

"Curb mass" means the actual or manufacturer's estimated mass of the vehicle with fluids at nominal capacity and with all equipment specified by the Administrator.

"Displacement", and "Displacement Class", see § 86.419.

"Engine family" means the basic classification unit of a manufacturer's product line used for the purpose of test fleet selection and determined in accordance with § 86.420.

"Engine-displacement-system combination" means an engine family-displacement-emission control system combination.

"EPA Enforcement Officer" means any officer or employee of the Environmental Protection Agency so designated in writing by the Administrator (or by his designee).

"Exhaust emissions" means substances emitted to the atmosphere from any opening downstream from the exhaust port of a motor vehicle engine.

"Fuel system" means the combination of fuel tank, fuel pump, fuel lines, oil injection metering system, and carburetor or fuel injection components, and includes all fuel system vents.

"Loaded vehicle mass" means curb mass plus 80 kg (176 lb.), average driver mass.

"Model year" means the manufacturer's annual production period (as determined by the Administrator) which includes January first of such calendar year. If the manufacturer has no annual production period, the term "model year" shall mean the calendar year.

"Motorcycle" means any motor vehicle with a headlight, taillight, and stoplight and having: Two wheels, or Three wheels and a curb mass less than or equal to 680 kilograms (1499 pounds).

"Oxides of nitrogen" means the sum of the nitric oxide and nitrogen dioxide contained in a gas sample as if the nitric oxide were in the form of nitrogen dioxide.

"Scheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed on a periodic basis to prevent part failure or vehicle malfunction, or anticipated as necessary to correct an overt indication of vehicle malfunction or failure for which periodic maintenance is not appropriate.

"Span gas" means a gas of known concentration which is used routinely to set the output level of any analyzer.

"System" includes any motor vehicle modification which controls or causes the reduction of substances emitted from motor vehicles.

"Total test distance" is defined for each class of motorcycles in § 86.427-78.

"Useful life" is defined for each class (see § 86.419) of motorcycle:

Class I—5.0 years or 12,000 km (7,456 miles), whichever first occurs.

Class II—5.0 years or 18,000 km (11,185 miles), whichever first occurs.

Class III—5.0 years or 30,000 km (18,641 miles), whichever first occurs.

"Unscheduled maintenance" means any inspection, adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed to correct or diagnose a part failure or vehicle malfunction which was not anticipated.

"Zero kilometers" means that point after normal assembly line operations and adjustments, after normal dealer setup and preride inspection operations have been completed, and before 100 kilometers of vehicle operation of three hours of engine operation have been accumulated, including emission testing if performed.

[42 FR 1126, Jan. 5, 1977, as amended at 42 FR 56737, Oct. 28, 1977; 49 FR 48138, Dec. 10, 1984]

§ 86.403-78 Abbreviations.

The abbreviations used in this subpart have the following meanings in both capital and lowercase:

ASTM—American Society for Testing and Materials.
C—Celsius.
cc—Cubic centimetre(s).
cfh—Cubic feet per hour.
cfm—Cubic feet per minute.
cm—Centimetre(s).
CO—Carbon monoxide.
CO_2—Carbon dioxide.
Conc—Concentration.
cu.—Cubic.
CVS—Constant volume sampler.
EGR—Exhaust gas recirculation.
EP—End point.
EPA—Environmental Protection Agency.
F—Fahrenheit.
h—hour.
HC—Hydrocarbon(s).
Hg—Mercury.
H_2O—Water.
in.—Inch(es).
K—Kelvin.
kg—Kilogram(s).
km—Kilometre(s).
kpa—Kilopascals.
lb—Pound(s).
m—Metre(s).
mph—Miles per hour.
mm—Millimetre(s).
N_2—Nitrogen.
NO_x—Oxides of nitrogen.
No.—Number.
O_2—Oxygen.
Pa—Pascal(s).
Pb—lead.
ppm—Parts per million by volume.
psi—Pounds per square inch.
psig—Pounds per square inch gauge.
R—Rankine.
rpm—Revolutions per minute.
wt—Weight.
°—Degree(s).
%—Percent.

§ 86.404-78 Section numbering.

(a) The year of initial applicability of a section is indicated by its section number. The two digits following the hyphen designate the first model year for which a section is effective. A section remains effective until superseded.

Example. Section 86.411-78 applies to 1978 and subsequent model years until it is superseded. If a § 86.411-81 is promulgated it would take effect beginning with 1981. § 86.411-78 would apply to years 1978 through 1980.

(b) A reference to a section without a year designation implies the appropriate model year.

Example. When considering 1979 vehicles a reference to § 86.411 implies § 86.411-79 However if no § 86.411-79 has been promulgated then § 86.411-78 is implied; See paragraph (a) of this section.

§ 86.405-78 Measurement system.

(a) This subpart and Subpart F have been written using System International (SI) units. SI units will be used to determine compliance with these regulations. English equivalents have been indicated solely for the user's convenience.

§ 86.406-78 Introduction, structure of subpart, further information.

(a) This subpart contains general provisions regulating the emission of air pollution from new motorcycles. Test procedures are found in Subpart F.

(b) Several discrete concepts are addressed:

(1) *Requirements.* Sections 86.407 to 86.415.

(2) *Application for certification.* Sections 86.416 and 86.417.

(3) *Test fleet selection.* Sections 86.418 to 86.423.

(4) *Service accumulation, testing, maintenance, certification.* Sections 86.424 to 86.439.

(5) *Administrative provisions.* Sections 86.440 to 86.444.

(c) The certification procedure to be followed depends upon the manufacturer's projected sales.

(1) New motorcycles, produced by a manufacturer whose projected U.S. sales of motorcycles is 10,000 or more units (for the model year in which certification is sought) shall demonstrate compliance with all general standards and all specific emission requirements before they can be sold in the United States. The manufacturer is required to submit an application with sales data, product information, required maintenance, testing and service accumulation procedures. The Administrator will select vehicle(s) which will represent the manufacturer's product line. The manufacturer is required to construct these vehicles to be representative of actual production. Service is accumulated and emission tests performed with data submitted to the Administrator. The Administrator may run his own tests to confirm the manufacturer's results. The Administrator will review the data and either grant or deny certification. If the manufacturer wishes to make changes to a certified vehicle, or to produce a new vehicle, the Administrator must be notified. The Administrator may require testing to demonstrate continued compliance with emission standards. Each vehicle must be labeled with tune up specifications and the purchaser must be supplied with maintenance instructions. Also, information on production vehicles must be supplied to the Administrator.

(2) New motorcycles produced by a manufacturer whose projected U.S. sales of motorcycles is less than 10,000 units (for the model year in which certification is sought) shall meet both the general standards and specific emission requirements described in §§ 86.401 through 86.417, § 86.425, § 86.437, and §§ 86.440 through 86.444 of this subpart before they can be sold in the United States. The manufacturer is required to submit an application containing a statement that his vehicles conform to the applicable emission standards. The manufacturer is required to retain in his records, but not submit with the application, valid emission test data which support his statement. The Administrator will review the application and either grant or deny certification. Each vehicle must be labeled with tune up specifications and the purchaser must be supplied with maintenance instructions. Also, information on production vehicles must be supplied to the Administrator.

(d) Manufacturers who are considering an application should contact: Director, Certification Division, Environmental Protection Agency, 2565 Plymouth Rd., Ann Arbor, Michigan 48105 and state whether he plans to certify for total sales of greater than or less than 10,000 vehicles for the applicable model year.

§ 86.407-78 Certificate of conformity required.

Every new motorcycle manufactured for sale, sold, offered for sale, introduced or delivered for introduction into commerce, or imported into the United States which is subject to any of the standards prescribed in this subpart is required to be covered by a certificate of conformity issued pursuant to this subpart.

§ 86.408-78 General standards; increase in emissions; unsafe conditions.

(a) Any system installed on or incorporated in a new motorcycle to enable such vehicle to conform to standards imposed by this subpart:

(1) Shall not in its operation or function cause the emission into the ambient air of any noxious or toxic substance that would not be emitted in the operation of such vehicle without such system, except as specifically permitted by regulation; and

(2) Shall not in its operation, function or malfunction result in any unsafe condition endangering the motorcycle, its rider(s), or persons or property in close proximity to the vehicle.

(b) Every manufacturer of new motorcycles subject to any of the standards imposed by this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motorcycles in accordance with good engineering practice to ascertain that such test vehicles will meet the requirements of this section for the useful life of the vehicle.

§ 86.409-78 Defeat devices, prohibition.

(a) No motorcycle shall be equipped with a defeat device.

(b) Defeat device means any element of design which:

(1) Senses temperature, vehicle speed, engine RPM, transmission gear, manifold vacuum, or any other parameter for the purpose of activating, modulating, delaying or deactivating the operation of any part of the emission control system and

(2) Reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal urban vehicle operation and use, unless

(i) Such conditions are substantially included in the Federal emission test procedure, or

(ii) The need for the device is justified in terms of protecting the vehicle against damage or accident, or

(iii) The device does not go beyond the requirements of engine starting or warm-up.

§ 86.410-80 Emission standards for 1980 and later model year motorcycles.

(a)(1) Exhaust emissions from 1980 and later model year motorcycles shall not exceed:

(i) *Hydrocarbons.* 5.0 grams per vehicle kilometre.

(ii) *Carbon monoxide.* 12 grams per vehicle kilometre.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over driving schedules as set forth in Subpart F and measured and calculated in accordance with those procedures.

(b) No crankcase emissions shall be discharged into the ambient atmosphere from any new motorcycle subject to this subpart.

[42 FR 1126, Jan. 5, 1977, as amended at 49 FR 48138, Dec. 10, 1984]

§ 86.410-90 Emission standards for 1990 and later model year motorcycles.

(a)(1) Exhaust emissions from 1990 and later model year gasoline-fueled motorcycles shall not exceed:

(i) *Hydrocarbons.* 5.0 grams per vehicle kilometer.

(ii) *Carbon monoxide.* 12 grams per vehicle kilometer.

(2) Exhaust emissions from 1990 and later model year methanol-fueled motorcycles shall not exceed:

(i) *Organic material hydrocarbon equivalent.* 5.0 grams per vehicle kilometer.

(ii) *Carbon monoxide.* 12 grams per vehicle kilometer.

(3) The standards set forth in paragraphs (a) (1) and (2) of this section refer to the exhaust emitted over driving schedule as set forth in Subpart F and measured and calculated in accordance with those procedures.

(b) No crankcase emissions shall be discharged into the ambient atmosphere from any new motorcycle subject to this subpart.

[54 FR 14539, Apr. 11, 1989]

§ 86.411-78 Maintenance instructions, vehicle purchaser.

(a) The manufacturer shall furnish or cause to be furnished to the ultimate purchaser of each new motorcycle the written instructions for the periodic and anticipated maintenance and use of the vehicle by the ultimate purchaser as may be reasonable and necessary to assure the proper functioning of emission control systems for the vehicle's useful life.

(1) Such instructions shall be provided for those vehicle and engine components listed in Appendix VI to this part (and for any other components) to the extent that maintenance of these components is necessary to assure the proper functioning of emission control systems.

(2) Such instructions shall be in the English language and in clear, and to the extent practicable, nontechnical language.

(b) The maintenance instructions required by this section shall:

(1) Contain a general description of the documentation which the manufacturer will require from the ultimate

purchaser or any subsequent purchaser as evidence of compliance with the instructions, and

(2) Specify the performance of all scheduled maintenance performed by the manufacturer under § 86.428.

§ 86.412-78 Maintenance instructions, submission to Administrator.

(a) *Instructions for ultimate purchaser.* (1) The manufacturer shall provide to the Administrator, at least 30 days before being supplied to the ultimate purchaser (unless the Administrator consents to a lesser period of time), a copy of the maintenance instructions which the manufacturer proposes to supply to the ultimate purchaser. The instructions must include the periodic and anticipated maintenance contained in the application for certification or contained in the manufacturers' records (if anticipated sales are less than 10,000 units). Such instructions must be reasonable and necessary to assure the proper functioning of the vehicle's emission control systems.

(2) Any revision to the maintenance instructions which will affect emissions shall be supplied to the Administrator at least 30 days before being supplied to the ultimate purchaser unless the Administrator consents to a lesser period of time.

(b) *Other instructions.* The manufacturer of any new motorcycle subject to any of the standards prescribed in this subpart shall submit to the Administrator at the time of issuance by the manufacturer, copies of all sales brochures, instructions, or explanations regarding the use, repair, adjustment, maintenance, or testing of such vehicle relevant to the control of crankcase or exhaust emissions, issued by the manufacturer for use by other manufacturers, assembly plants, distributors, dealers, repair facilities, and ultimate purchasers. Any material not translated into the English language need not be submitted unless specifically requested by the Administrator.

§ 86.413-78 Labeling.

(a)(1) The manufacturer of any motorcycle shall, at the time of manufacture, affix a permanent, legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles available for sale to the public and covered by a certificate of conformity.

(2) A permanent, legible label shall be affixed in a readily accessible position. Multi-part labels may be used.

(3) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label.

(4) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(i) *The label heading.* Vehicle Emission Control Information;

(ii) Full corporate name and trademark of the manufacturer;

(iii) Engine displacement (in cubic centimetres) and engine family identification;

(iv) Engine tune up specifications and adjustments, as recommended by the manufacturer, including idle speed, ignition timing, and the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop). These specifications shall indicate the proper transmission position during tune up;

(v) Any specific fuel or engine lubricant requirements (e.g., lead content, Research octane number, engine lubricant type);

(vi) An unconditional statement of conformity to USEPA regulations which includes the model year; for example, This Vehicle Conforms to USEPA Regulation Applicable to .... Model Year New Motorcycles.

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle conforms to any other applicable Federal or State standards for new motorcycles or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the vehicle.

[42 FR 1126, Jan. 5, 1977, as amended at 42 FR 56737, Oct. 28, 1977]

§ 86.414-78 Submission of vehicle identification number.

(a) Upon request by the Administrator, the manufacturer of any motorcycle covered by a certificate of conformity shall, within 30 days, identify by vehicle identification number, the vehicle(s) covered by the certificate of conformity.

(b) The manufacturer of any motorcycle covered by a certificate of conformity shall furnish to the Administrator, at the beginning of each model year, any vehicle identification number coding system which identifies whether such vehicle(s) are covered by a certificate of conformity.

§ 86.415-78 Production vehicles.

(a) Any manufacturer obtaining certification shall supply to the Administrator, upon his request, a reasonable number of production vehicles selected by the Administrator which are representative of the engines, emission control systems, fuel systems, and transmissions offered and typical of production models available for sale under the certificate. These vehicles shall be supplied for testing at such time and place and for such reasonable periods as the Administrator may require.

(b) Any manufacturer obtaining certification shall notify the Administrator, on a yearly basis, of the number of vehicles of each engine family—engine displacement—emission control system—fuel system—transmission type—inertial mass category combination produced for sale in the United States during the preceding year.

(c) All motorcycles covered by a certificate of conformity shall prior to delivery to the ultimate purchaser be adjusted, by the manufacturer or his agent, to the ignition timing specification detailed in § 86.413.

(Approved by the Office of Management and Budget under control number 2000-0390)

[42 FR 1126, Jan. 5, 1977, as amended at 49 FR 48138, Dec. 10, 1984]

§ 86.416-80 Application for certification.

(a) New motorcycles produced by a manufacturer whose projected sales in the United States is 10,000 or more units (for the model year in which certification if sought) are covered by the following:

(1) An application for a certificate of conformity to the regulations in the English language applicable to new motorcycles shall be made to the Administrator by the manufacturer and shall be updated and corrected by amendment. Where possible, a manufacturer should include in a single application for certification, a description of all vehicles in each class for which certification is required. A manufacturer may, however, choose to apply separately for certification of part of his product line. The selection of test vehicles and the computation of test results will be determined separately for each application.

(2) The application shall be in writing signed by an authorized representative of the manufacturer, and shall include the following:

(i) Identification and description of the vehicles covered by the application and a description of their engine, emission control system and fuel system components. This shall include a detailed description of each auxiliary emission control device. Transmission gear ratios, overall drive ratios and vehicle mass (or range of mass) shall also be included. The label and its location shall be specified, § 86.413 Available optional equipment shall be described.

(ii) The range of available fuel and ignition system adjustments.

(iii) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles for which certification is requested. If reduced testing based on low sales volume is requested the method of predicting sales shall be described.

(iv) A description of the test equipment (if applicable) and fuel and engine lubricant proposed to be used.

(v) A description of the proposed service accumulation procedure and a description of the proposed scheduled maintenance.

(vi) A statement of recommended periodic and anticipated maintenance and procedures necessary to assure that the vehicles covered by a certificate of conformity in operation conform to the regulations, listings of the fuels and lubricants to be recommended to the ultimate purchaser and a description of the program for training of personnel for such maintenance, and the equipment required to perform this maintenance.

(vii) A description of normal assembly line operations and adjustments if such procedures exceed 100 km (62 miles) or three hours of engine operations.

(3) Completed copies of the application and of any amendments thereto, and all notifications under §§ 86.438 and 86.439 shall be submitted in such multiple copies as the Administrator may require.

(4) For purposes of this section, "auxiliary emission control device" means any element of design which senses temperature, vehicle speed, engine RPM, transmission gear, manifold vacuum, or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of any part of the emission control system.

(b) New motorcycles produced by a manufacturer whose projected sales in the United States is less than 10,000 units (for the model year in which certification is sought) are covered by the following:

(1) All the information that would otherwise be required to be submitted to EPA under paragraph (a)(2) of this section must be made a part of the manufacturer's records, except there is no requirement to submit the information to the Administrator or receive approval from the Administrator.

(2) Section 86.437 details the statements that these manufacturers are required to provide to the Administrator.

(c) For the purpose of determining applicability of paragraphs (a) or (b) of this section, where there is more than one importer or distributor of vehicles manufactured by the same person, the projected sales shall be the aggregate of the projected sales of those vehicles by such importers or distributors.

(d)(1) The Administrator has determined that the following certification procedure may be used to demonstrate compliance for each motorcycle engine family for which certification is sought. Manufacturers may follow these procedures at their option.

(i) The manufacturer shall satisfy all applicable requirements of Part 86 necessary to demonstrate compliance with the standards for each class of new motorcycles for which certification is sought.

(ii) As specifically allowed by the Administrator the manufacturer shall assume the responsibility for part or all of the decisions applicable to the family for which certification is sought and which are within the jurisdiction of the Administrator, with the exception that the Administrator will determine whether a test motorcycle has met the applicable emission standards.

(iii) The manufacturer shall maintain, update, and correct all records and information required.

(iv) The Administrator may review a manufacturer's records at any time. At the Administrator's discretion, this review may take place either at the manufacturer's facility or at another facility designated by the Administrator.

(v) At the Administrator's request, the manufacturer shall notify the Administrator of the status of the certification program including projected schedules of those significant accomplishments specified by the Administrator.

(vi) The manufacturer shall permit the Administrator to inspect any facilities, records, and vehicles from which data were obtained under the abbreviated certification review procedure.

(vii) Upon completing all applicable requirements of Part 86 the manufacturer shall submit a separate application for a certificate of conformity for each class of new motorcycles for which certification is sought. Such application shall be made in writing to the Administrator by the manufacturer.

(A) The Administrator may approve or disapprove in whole or in part an application for certification according to the procedures specified in § 86.417-78(b).

(B) If, after a review of the application for certification, test reports and data submitted by the manufacturer, data obtained during an inspection, and any other pertinent data or information, the Administrator determines that a test vehicle(s) has not met the requirements of the Act and the applicable subpart, he will notify the manufacturer in writing and set forth the reason(s) for the determination.

(2) Those families which are not following the procedure described in paragraph (d)(1) of this section will follow the procedure in this subpart with the exception of paragraph (d)(1) of this section.

(e) The Administrator may require that an engine family previously allowed to be subjected to the abbreviated certification review procedure be transferred to the complete review procedure.

(Approved by the Office of Management and Budget under control number 2000-0390)

[42 FR 56737, Oct. 28, 1977, as amended at 45 FR 26045, Apr. 17, 1980; 49 FR 48138, Dec. 10, 1984]

§ 86.417-78 Approval of application for certification.

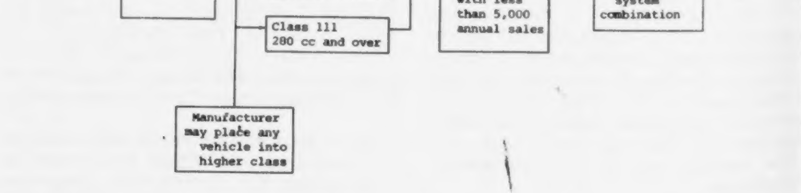
(a) After a review of the application for certification and any other information which the Administrator may require, the Administrator may approve the application and select a test fleet as appropriate.

(b) The Administrator may disapprove in whole or in part an application for certification for reasons including incompleteness, inaccuracy, inappropriate proposed distance accumulation procedures, maintenance, test equipment, label content or location, fuel or lubricant, and incorporation of defeat devices in vehicles described by the application. Where any part of an application is rejected the Administrator shall notify the manufacturer in writing and set forth the reasons for such rejection. The manufacturer may request a hearing under § 86.443.

§ 86.418-78 Test fleet selection.

(a) Test fleet selection and requirements on test vehicles are found in §§ 86.419 to 86.423. This selection process is also graphically depicted in Figure E78-1.

Figure E78-1 Selection Process


Application
Vehicles Grouped into displacement classes
Class 1 50 - 169cc
Class 11 170 - 279cc
Class 111 280 cc and over
Manufacturer may place any vehicle into higher class
Manufacturer requests reduced test vehicles for engine families with less than 5,000 annual sales
YES
NO
One vehicle selected per engine family
One vehicle selected for each engine family - displacement-system combination
Testing

§ 86.419-78 Engine displacement, motorcycle classes.

(a)(1) Engine displacement shall be calculated using nominal engine values and rounded to the nearest whole cubic centimetre, in accordance with ASTM E 29-67.

(2) For rotary engines, displacement means the maximum volume of a combustion chamber between two rotor tip seals minus the minimum volume of that combustion chamber between those two rotor tip seals times three times the number of rotors.

cc=(max. chamber volume'min. chamber volume)×3×no. of rotors

(b) Motorcycles will be divided into classes based on engine displacement.

(1) Class I—50 to 169 cc (3.1 to 10.4 cu. in.).

(2) Class II—170 to 279 cc (10.4 to 17.1 cu. in.).

(3) Class III—280 cc and over (17.1 cu. in. and over).

(c) At the manufacturer's option, a vehicle described in an application for certification may be placed in a higher class (larger displacement). All procedures for the higher class must then be complied with, compliance with emission standards will be determined on the basis of engine displacement.

§ 86.420-78 Engine families.

(a) The vehicles covered in the application will be divided into groupings whose engines are expected to have similar emission characteristics throughout their useful life. Each group of engines with similar emission characteristics shall be defined as a separate engine family.

(b) *Reciprocating families.* To be classed in the same engine family, reciprocating engines must be identical in all of the following applicable respects:

(1) The combustion cycle.

(2) The cooling mechanism.

(3) The cylinder configuration (inline, vee, opposed, bore spacings, etc.).

(4) The number of cylinders.

(5) The engine displacement class, § 86.419.

(6) The method of air aspiration.

(7) The number of catalytic converters, location, volume, and composition.

(8) The thermal reactor characteristics.

(9) The number of carburetors.

(10) The prechamber characteristics.

(c) At the manufacturer's option, reciprocating engines identical in all the respects listed in paragraph (b) of this section may be further divided into different engine families if the Administrator determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of features such as:

(1) The bore and stroke.

(2) The combustion chamber configuration.

(3) The intake and exhaust timing method of actuation (poppet valve, reed valve, rotary valve, etc.).

(4) The intake and exhaust valve or port sizes, as applicable.

(5) The fuel system.

(6) The exhaust system.

(d) *Rotary families.* To be classed in the same engine family, rotary combustion cycle engines must be identical in all of the following applicable respects:

(1) The major axis of the epitrochoidal curve.

(2) The minor axis of the epitrochoidal curve.

(3) The generating radius of the epitrochoidal curve.

(4) The cooling mechanism.

(5) The number of rotors.

(6) The engine displacement class, § 86.419.

(7) The method of air aspiration.

(8) The number of catalytic converters, location, volume and composition.

(9) The thermal reactor characteristics.

(10) The number of carburetors.

(11) The prechamber characteristics.

(e) At the manufacturer's option, rotary combustion cycle engines identical in all the respects listed in paragraph (d) of this section, may be further divided into different engine families if the Administrator determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of features, such as:

(1) The width of the rotor housing.

(2) The type and location of intake port (side, peripheral, combination, etc.).

(3) The number of spark plugs per rotor.

(4) The fuel system.

(5) The exhaust system.

(f) Where engines are of a type which cannot be divided into engine families based upon the criteria listed in paragraphs (b) and (d) of this section, the Administrator will establish families of those engines based upon the features most related to their emission characteristics.

[42 FR 1126, Jan. 5, 1977, as amended at 44 FR 48205, Aug. 17, 1979]

§ 86.421-78 Test fleet.

(a) A test vehicle will be selected by the Administrator to represent each engine-displacement-system combination. The configuration (engine calibration, transmission, drive ratio, mass, options, etc.) in the manufacturer's application which the Administrator believes has the greatest probability of exceeding the standards will be selected.

(b) At the manufacturer's option, the Administrator will only select one vehicle to represent each engine family where the total projected annual sales for that family are less than 5,000 vehicles.

(c) A manufacturer may elect to operate and test additional vehicles which are identical to those selected by the Administrator. Written notice of a commitment to operate and test additional vehicles shall be given to the Administrator prior to the start of testing and not later than 30 days following notification of the test fleet selection. The results of tests performed by the manufacturer will be combined to determine deterioration factors. Each vehicle must meet applicable standards when tested by the Administrator and when those results are projected to the useful life.

(d) In lieu of testing a test vehicle and submitting data therefore, a manufacturer may, with the prior written approval of the Administrator, submit exhaust emission data on a similar vehicle for which certification has previously been obtained or for which all applicable data has previously been submitted.

§ 86.422-78 Administrator's fleet.

The Administrator may require additional test vehicles identical in all material respects to vehicles selected in accordance with § 86.421. The number of vehicles selected shall not increase the size of the test fleet by more than 20 percent or one vehicle, whichever is greater.

§ 86.423-78 Test vehicles.

(a)(1) Before beginning service accumulation on a test vehicle, the manufacturer may perform a zero-kilometer exhaust emission test.

(2) If such a test is performed, the data shall be submitted to the Administrator when the application is submitted.

(3) Zero-kilometer test results shall not be included in the determination of deterioration factors.

(b) Once a manufacturer begins to operate a test vehicle, as indicated by compliance with paragraph (a) of this section, the data from the vehicle will be used, unless specified otherwise by the Administrator. Discontinuation of a vehicle shall be allowed only with the written consent of the Administrator.

(c) Test vehicles shall be calibrated at zero kilometres within the production tolerances applicable to the manufacturer's specifications.

(d) The Administrator may disqualify a vehicle which receives assembly line operations and adjustments which will not be performed on production vehicles.

(Approved by the Office of Management and Budget under control number 2000-0390)

[42 FR 1126, Jan. 5, 1977, as amended at 4 FR 48138, Dec. 10, 1984]

§ 86.425-78 Test procedures.

(a) Motorcycle emission test procedures are found in Subpart F.

(b) The Administrator may prescribe emission test procedures for any motorcycle which he determines is not susceptible to satisfactory testing by the procedures set forth in Subpart F.

(c) Testing of any type with respect to any test vehicle other than that specified in this subpart and Subpart F is not allowed except as specifically authorized by the Administrator.

§ 86.426–78 Service accumulation.

(a) The procedure for service accumulation will be the Durability Driving Schedule as specified in Appendix IV to this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate distance at a measured curb mass which is within 5 kg (11.0 lb) of the loaded vehicle mass specified by the Administrator.

(b) During service accumulation, vehicles shall not be operated for more than 12 hours during an operating sequence. Engine shutdowns are permitted during the operating sequence, but the periods of shutdown are not included in the 12 hour total. Following each operating sequence, the vehicle shall soak, without operation, for a minimum of 8 hours. During soak periods, the vehicle shall be exposed to normal outside ambient temperatures and humidity conditions unless vehicle maintenance or servicing is being performed.

(c) The manufacturer's recommended shifting procedure will be used for laps 1 through 10. Lap 11 shifts (W.O.T. accelerations) must be conducted at the manufacturer's recommended maximum safe engine speed.

[42 FR 1126, Jan. 5, 1977, as amended at 42 FR 56737, Oct. 28, 1977]

§ 86.427–78 Emission tests.

(a)(1) Each test vehicle shall be driven with all emission control systems installed and operating for the following total test distances, or for such lesser distances as the Administrator may agree to as meeting the objectives of this procedure. (See § 86.419 for class explanation.)

Displacement class	Total test distance (kilometers)	Minimum test distance (kilometers)	Minimum number of tests
I	6,000	2,500	4
II	9,000	2,500	4
III	15,000	3,500	4

(2) A zero kilometer emission test may be performed prior to the beginning of service accumulation.

(b) All vehicles shall undergo at least four emission tests; one at the minimum test distance, one before and one after periodic maintenance, and one at the total test distance. If no maintenance is scheduled, then at least two tests will be performed, at equal intervals, between the minimum and total test distances. Additional tests may be performed; such tests must be at equal intervals and approved by the Administrator prior to starting service accumulation.

(c) Where the Administrator agrees to a lesser distance for service accumulation, he may modify the maintenance provisions of this subpart.

(d) All tests required by this subpart must be conducted at an accumulated distance within 250 kilometers (155 mi) of the nominal distance at each test point.

(e)(1) If a manufacturer conducts multiple tests at any test point at which the data are intended to be used in the calculation of the deterioration factor, the number of tests must be the same at each point and may not exceed three valid tests unless the manufacturer chooses to average the test results.

(2) If the manufacturer chooses to average the test results at a test point, he may conduct more tests than the minimum number of tests conducted at any other test point.

The results of the multiple tests shall be averaged to create a single value which is the test point value used in the deterioration factor calculation specified in § 86.432–78.

(3) When using this option to generate data for a particular test point, the manufacturer must include in the average all valid test data generated at that test point.

(4) The manufacturer shall follow the same procedure for all exhaust pollutants.

(5) The test results obtained from the emission tests performed before and after maintenance affecting emissions shall not be averaged.

(f) The Administrator may require that any one or more of the test vehicles be submitted to him, at such places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(g) Whenever the Administrator conducts a test on a test vehicle, the results of that test, unless subsequently invalidated by the Administrator, shall comprise the data for the vehicle at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(Approved by the Office of Management and Budget under control number 2000-0390)

[42 FR 1126, Jan. 5, 1977, as amended at 49 FR 48139, Dec. 10, 1984]

§ 86.428–80 Maintenance, scheduled; test vehicles.

(a) Periodic maintenance on the engine, emission control system, and fuel system of test vehicles shall be scheduled for performance at the same distance intervals that will be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser. Such maintenance shall be performed only under the following provisions.

(b) Periodic major engine tune-ups to the manufacturer's specifications may be performed no more frequently than as follows nor may any tune-up be performed within 1000 km prior to the official test.

Displacement class	Minimum interval (kilometers)
I	3,000
II	3,000
III	4,000

(c) A scheduled major engine tune-up shall be restricted to items listed below and shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by customer service personnel. The following items may be inspected, replaced, cleaned, adjusted, and/or serviced as required: (1) Breaker points, timing, (2) idle speed and idle air/fuel mixture, (3) valve lash, (4) engine bolt torque, and (5) spark plugs.

(d) The Administrator will specify the ignition timing, idle air fuel mixture and other fuel system adjustments to be used at each tune-up. The settings selected will be those the Administrator deems appropriate within the physically available range.

(e) Periodic change of engine and transmission oil, and change or service of oil, air, and fuel filters will be allowed at the same distance intervals that will be specified in the manufacturer's maintenance instructions.

(f) Requests for authorization of periodic maintenance of emission control related components not specifically authorized to be maintained by this section, and for anticipated maintenance (see § 86.428), must be made prior to the beginning of distance accumulation. The Administrator will approve the performance of such maintenance if the manufacturer makes a satisfactory showing that the maintenance will be performed on vehicles in use and that the maintenance is reasonable and necessary.

(1) The EGR system may be serviced a maximum of two times during the durability service accumulation if failure of the EGR system activates an audible and/or visual signal approved by the Administrator which alerts the vehicle operator to the need for EGR system maintenance, or if the need for periodic maintenance of the EGR system is overtly signalled to the vehicle operator by an appropriate means

e.g., an indicator light or significantly reduced driveability performance.

(2) The catalytic converter may be serviced only once during the durability service accumulation if failure of the catalytic converter activates an audible and/or visual signal approved by the Administrator which alerts the vehicle operator to the need for catalytic converter maintenance, or if the need for periodic maintenance of the catalytic converter is overtly signalled to the vehicle operator by an appropriate means, e.g., an indicator light or significantly reduced driveability performance.

(g) Certain engine components may require maintenance which, by its nature, cannot be scheduled for periodic intervals, but which the manufacturer believes will be necessary. For example, piston and cylinder replacement caused by piston seizure which results in the vehicle being inoperative; or in the case of two-stroke engines, decarbonization, the need for which is signalled to the vehicle operator by significantly reduce driveability performance. Such maintenance is designated anticipated maintenance. Anticipated maintenance must be identified by the manufacturer and approved as being appropriate by the Administrator prior to the start of service accumulation. The approximate distance at which the need for anticipated maintenance may arise must be specified in the application for certification.

(h) Complete emission tests (see Subpart F) are required, unless waived by the Administrator, before and after any vehicle maintenance which may reasonably be expected to affect emissions.

§ 86.429-78 Maintenance, unscheduled; test vehicles.

(a) Any unscheduled engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on vehicles shall be performed only with the advance approval of the Administrator.

(1) In the case of unscheduled maintenance, such approval will be given if the Administrator:

(i) Has made a preliminary determination that part failure or system malfunction, or the repair of such failure or malfunction, does not render the vehicle unrepresentative of vehicles in use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement; and

(ii) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfire, vehicle stall, overheating, fluid leakage, loss of oil pressure, or charge indicator warning.

(2) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (a)(1)(i) of this section.

(b) Repairs to vehicle components of test vehicles, other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(c) The Administrator shall be given the opportunity to verify the extent of an overt indication of part failure and/or vehicle malfunction (e.g., misfire, stall), or an activation of an audible and/or visual signal, prior to the performance of any maintenance to which such overt indication or signal is relevant under the provisions of this section.

(d) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available at dealerships and other service outlets and

(1) Are used in conjunction with scheduled maintenance on such components, and

(2) Are used subsequent to the identification of a vehicle or engine malfunction, as provided in paragraph (a)(1) of this section for durability or emission data vehicles, or

(3) Unless specifically authorized by the Administrator.

(e) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the vehicle unrepresentative of vehicles in use, the vehicle shall not be used as a test vehicle.

(f) Complete emission tests are required, unless waived by the Administrator, before and after any vehicle maintenance which may reasonably be expected to affect emissions.

§ 86.430–78 Vehicle failure.

Any test vehicle which incurs major mechanical failure necessitating disassembly of the engine shall not be used as a test vehicle. This prohibition does not apply to failures occurring after the completion of all required tests at the total test distance.

[49 FR 48139, Dec. 10, 1984]

§ 86.431–78 Data submission.

(a) Data from all tests (including voided tests) performed by a manufacturer with total projected sales in excess of 10,000 vehicles shall be included in the application.

(b) The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer. If the Administrator determines that voiding the test was not appropriate, the Administrator may require that the data from that test be used in the calculation of the deterioration factor for emissions.

(c) When unscheduled for anticipated maintenance is performed, a complete record of all pertinent maintenance, including the malfunction diagnosis made, the corrective action taken, and the test data obtained shall be included in the application.

(d) A complete record of all maintenance shall be supplied.

(Approved by the Office of Management and Budget under control number 2000-0390)

[42 FR 1126, Jan. 5, 1977, as amended at 49 FR 48139, Dec. 10, 1984]

§ 86.432–78 Deterioration factor.

(a) Deterioration factors shall be developed for each test vehicle from the emission test results. A separate factor shall be developed for each pollutant. The applicable data to be used in calculating these factors are:

(1) The results from all valid tests conducted by the manufacturer or Administrator at scheduled test intervals.

(2) The results from tests conducted before and after scheduled maintenance unless specifically excluded by the Administrator.

(3) The results from tests conducted before and after unscheduled maintenance, if approval of the maintenance by the Administrator was conditioned on the data being used in the deterioration factor calculation.

(b) Emission results which are less than 0.10 g/km shall be considered to be 0.10 g/km for purposes of this section.

(c) Test results for each pollutant shall be plotted as a function of the service accumulated at the start of the emission test, rounded to the nearest kilometre. These results shall be correlated to a straight line, fit by the method of least squares.

(d) An exhaust emission deterioration factor will be calculated by dividing the predicted emissions at the useful life distance by the predicted emissions at the total test distance. Predicted emissions are obtained from the correlation developed in paragraph (c) of this section.

Factor = Predicted total distance emissions/
Predicted total test distance emissions

These interpolated and extrapolated values shall be carried out to four places to the right of the decimal point before dividing one by the other to determine the deterioration factor. The results shall be rounded to three places to the right of the decimal point in accordance with ASTM E 29-67.

(e) Deterioration factors computed to be less than 1.000 shall be 1.000.

(f)(1) The manufacturer has the option of applying an outlier test point procedure to completed durability data within its certification testing program for a given model year.

(2) The outlier procedure will be specified by the Administrator.

(3) For any pollutant, durability data test points that are identified as outliers shall not be included in the determination of deterioration factors

if the manufacturer has elected this option.

(4) The manufacturer shall specify to the Administrator, before the certification of the first engine family for that model year, if it intends to use the outlier procedure.

(5) The manufacturer may not change procedures after the first engine family of the model year is certified.

(6) Where the manufacturer chooses to apply the outlier procedure to a data set containing data which were averaged under § 86.427-78(e), the outlier procedure shall be completed before averaging the data.

(Approved by the Office of Management and Budget under control number 2000-0390)

[42 FR 1126, Jan. 5, 1977, as amended at 42 FR 56737, Oct. 28, 1977; 49 FR 48139, Dec. 10, 1984]

§ 86.434-78 Testing by the Administrator.

(a) At the conclusion of service accumulation, and after emission tests for deterioration, the Administrator may require confirmatory testing. The Administrator will designate where such testing shall be performed.

(b) The manufacturer may request a retest. The results of the retest will be used to determine compliance.

(c) If the emission results exceed the standard, certification will be denied.

(Approved by the Office of Management and Budget under control number 2000-0390)

[49 FR 48139, Dec. 10, 1984]

§ 86.435-78 Extrapolated emission values.

(a) If the deterioration factor lines are below the standards between the minimum test distance and the useful life, or if all points used to generate the lines are below the standards, predicted useful life emissions shall be calculated. If not, the manufacturers may elect to withdraw the vehicle or accumulate additional service.

(b) The emission test results of each pollutant obtained from the half life test will be multiplied by the appropriate deterioration factors to determine useful life emissions.

(1) If the useful life emissions are below the standards, certification will be granted.

(2) If any of the useful life emissions exceed the emission standards, the vehicle must (if not withdrawn) accumulate distance to the useful life.

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[42 FR 1126, Jan. 5, 1977, as amended at 49 FR 48139, Dec. 10, 1984]

§ 86.436-78 Additional service accumulation.

(a) Additional service up to the useful life will be accumulated under the same conditions as the initial service accumulation.

(b) New deterioration lines will be generated using all applicable test points up to the useful life. The same procedures for determining the original deterioration lines will be used.

(c) [Reserved]

(d) To qualify for certification:

(1) The full life emission test results must be below the standards, and

(2) The deterioration line must be below the standard at the minimum test distance and the useful life, or all points used to generate the line, must be below the standard.

(e) If the vehicle is unable to complete the total distance due to engine mechanical failure, certification will be granted if:

(1) The mechanical failure was anticipated, § 86.428, and

(2) A new deterioration line calculated using the procedure described in § 86.436-78(b) is below the standard at the minimum test distance and at the useful life, and,

(3) The results of the half life emission tests, when adjusted by the new deterioration factors, are below the standards.

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[42 FR 1126, Jan. 5, 1977, as amended at 49 FR 48139, Dec. 10, 1984]

§ 86.437-78 Certification.

(a) New motorcycles produced by a manufacturer whose projected sales in the United States is 10,000 or more units (for the model year in which certification is sought) are covered by the following:

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(1) The manufacturer shall submit to the Administrator a statement that the test vehicles with respect to which data are submitted have been tested in accordance with the applicable test procedures, that they meet the requirements of such tests, and that, on the basis of such tests, they conform to the requirements of the regulations in this part. If such statements cannot be made with respect to any vehicle tested, the vehicle shall be identified, and all pertinent test data relating thereto shall be supplied.

(2)(i) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 86.441 and any other pertinent data or information, the Administrator determines that a test vehicle(s) meets the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such vehicle(s) except in cases covered by § 86.442.

(ii) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any new motorcycle covered by the certificate will meet the requirements of the act and of this subpart.

(iii) The certificate will cover all vehicles represented by the test vehicle and will certify compliance with no more than one set of applicable standards.

(3)(i) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to § 86.427, or information derived from any inspection carried out under § 86.441, or any other pertinent data or information, the Administrator determines that one or more test vehicles of the certification test fleet do not meet applicable standards, he will notify the manufacturer in writing, setting forth the basis for his determination. The manufacturer may request a hearing on the Administrator's determination.

(ii) The manufacturer may, at his option, proceed with any of the following alternatives with respect to any vehicles represented by a test vehicle(s) determined not in compliance with applicable standards:

(A) Request a hearing.

(B) Delete from the application for certification the vehicles represented by the failing test vehicle. (Vehicles so deleted may be included in a later request for certification under paragraph (b)(2)(iii) of this section.) The Administrator will then select in place of each failing vehicle an alternate vehicle chosen in accordance with selection criteria employed in selecting the vehicle that failed, or

(C) Repair the test vehicle and demonstrate by testing that it meets applicable standards. Another vehicle which is in all material respects the same as the first vehicle, as repaired, shall then be operated and tested in accordance with applicable test procedures.

(iii) If the manufacturer does not request a hearing or present the required data under subparagraph (2) of this paragraph, the Administrator will deny certification.

(b) New motorcycles produced by a manufacturer whose projected sales in the United States is less than 10,000 units (for the model year in which certification is sought) are covered by the following:

(1) The manufacturer shall submit to the Administrator an application for certification containing the following:

(i) A brief description of the vehicles to be covered by the certificate (the manufacturer's sales data book or advertising including specifications will satisfy this requirement for most manufacturers).

(ii) A statement signed by the authorized representative of the manufacturer stating: "The vehicles described herein have been tested in accordance with the provisions of Subpart E, Part 86, Title 40, of the Code of Federal Regulations, and on the basis of these tests are in conformance with that subpart. All of the data and records required by that subpart are on file and are available for inspection by the Administrator. Total sales of vehicles subject to this subpart will be limited to less than 10,000 units."

(2) If, after a review of the statement the Administrator determines

that the requirements of this subpart have been met, he will issue a certificate of conformity with respect to the described vehicles except in cases covered by § 86.442.

(3) Such certificate will be issued for such a period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any new motorcycle covered by the certificate will meet the requirements of the Act and of this subpart.

(4) The certificate will cover all vehicles described by the manufacturer.

(5)(i) If, after a review of the statements and descriptions submitted by the manufacturer, the Administrator determines that the applicable requirements have not been met, he will notify the manufacturer in writing, setting forth the basis for his determination. The manufacturer may request a hearing on the Administrator's determination.

(ii) If the manufacturer does not request a hearing or present the required information the Administrator will deny certification.

[42 FR 1126, Jan. 5, 1977, as amended at 42 FR 56738, Oct. 28, 1977; 46 FR 50496, Oct. 13, 1981; 47 FR 49807, Nov. 2, 1982]

§ 86.438-78 Amendments to the application.

(a) The manufacturer shall inform the Administrator by way of amendment to the application of any proposed changes to vehicles in production or additional vehicles to be produced. The Administrator will, if appropriate, select a new test vehicle. Except as provided in § 86.439, no changes may be instituted until approved by the Administrator.

(b) The Administrator may allow reduced testing.

§ 86.439-78 Alternative procedure for notification of additions and changes.

(a)(1) A manufacturer may, in lieu of notifying the Administrator in advance of an addition of a vehicle or a change in a vehicle under § 86.438-78, notify the Administrator concurrently with the addition of a vehicle or the making of a change in a vehicle if the manufacturer determines that following the change all vehicles affected by the addition or change will still meet the applicable emission standards.

(2) Such notification shall include a full description of the addition or change and any supporting documentation the manufacturer may include to support the manufacturer's determination that the addition or change does not cause noncompliance.

(3) The manufacturer's determination that the addition or change does not cause noncompliance shall be based on an engineering evaluation of the addition or change and/or testing.

(b) [Reserved]

(c)(1) The Administrator may require that additional emission testing be performed to support the manufacturer's original determination submitted in accordance with paragraph (a) of this section.

(2) If additional testing is required, the Administrator shall proceed as in § 86.438-78.

(3) Additional test data, if requested, must be provided within 30 days of the request or the manufacturer must rescind the addition or change immediately.

(4) The Administrator may grant additional time to complete testing.

(5) If based on this additional testing or any other information, the Administrator determines that the vehicles affected by the addition or change do not meet the applicable standards, the Administrator will notify the manufacturer to rescind the addition or change immediately upon receipt of the notification.

(d) Election to produce vehicles under this section will be deemed to be a consent to recall all vehicles which the Administrator determines under § 86.438-78 do not meet applicable standards, and to cause such nonconformity to be remedied at no expense to the owner.

(Approved by the Office of Management and Budget under control number 2000-0390)

[49 FR 48139, Dec. 10, 1984]

§ 86.440-78 Maintenance of records.

(a) The manufacturer of any motorcycle subject to any of the standards or procedures prescribed in this subpart shall establish, maintain and retain the following adequately organized and indexed records;

(1) *General records.* (i)(A) Identification and description of all certification vehicles for which testing is required under this subpart.

(B) A description of all emission control systems which are installed on or incorporated in each certification vehicle.

(C) A description of all procedures used to test each such certification vehicle.

(ii) A properly completed application, following the format prescribed by the U.S. EPA for the appropriate year of production, fulfills each of the requirements of this paragraph.

(2) *Individual records.* (i) A brief history of each motocycle used for certification under this subpart including:

(A)(*1*) In the case where a current production engine is modified for use in a certification vehicle, a description of the process by which the engine was selected and of the modification made.

(*2*) In the case where the engine for a certification vehicle is not derived from a current production engine, a general description of the build-up of the engine (e.g., experimental heads were cast and machined according to supplied drawings, etc.)

(*3*) In both cases above, a description of the origin and selection process for the carburetor, fuel system, emission control system components, and exhaust after treatment device shall be included.

(*4*) The required description shall specify the steps taken to assure that the certification vehicle with respect to its engine, drive train, fuel system, emission control system components, exhaust after treatment device, vehicle mass, or any other device or component that can reasonably be expected to influence exhaust emissions, will be representative of production vehicles, and that either all components and/or vehicle construction processes, component inspection and selection techniques, and assembly techniques employed in constructing such vehicles are reasonably likely to be implemented for production vehicles, or they are as closely analogous as practicable to planned construction and assembly processes.

(B) A complete record of all emission test performed (except tests performed by EPA directly) including test results, the date and purpose of each test, and the distance accumulated on the vehicle.

(C) The date of each service accumulation run, listing the distance accumulated.

(D) [Reserved]

(E) A record and description of all maintenance and other servicing performed, giving the date of the maintenance or service and the reason for it.

(F) A record and description of each test performed to diagnose engine or emissions control system performance, giving the date and time of the test and the reason for it.

(G) [Reserved]

(H) A brief description of any significant events affecting the vehicle during any time in the period covered by the history, not described by an entry under one of the previous headings, including such extraordinary events as vehicle accidents or dynamometer runaway.

(ii) Each such history shall be started on the date that the first of any of the selection or build-up activities in paragraph (a)(2)(i)(A) of this section occurred with respect to the certification vehicle, shall be updated each time the operational status of the vehicle changes or additional work is performed on it, and shall be kept in a designated location.

(3) All records, other than routine emission test records, required to be maintained under this subpart shall be retained by the manufacturer for a period of six (6) years after the issuance of all certificates of conformity to which they relate. Routine emission test records shall be retained by the manufacturer for a period of one (1) year after issuance of all certificates of conformity to which they relate. Records may be retained as hard copy or reduced to microfilm, punch cards, etc., depending on the record retention procedures of the manufacturer: *Provided* That, in every case, all the information contained in the hard copy shall be retained.

(Approved by the Office of Management and Budget under control number 2000-0390)

[42 FR 1126, Jan. 5, 1977, as amended at 42 FR 56738, Oct. 28, 1977; 49 FR 48140, Dec. 10, 1984]

§ 86.441-78 Right of entry.

(a) Any manufacturer who has applied for certification of a new motorcycle subject to certification tests under this Subpart shall admit or cause to be admitted any EPA Enforcement Officer during operating hours on presentation of any credentials to any of the following:

(1) Any facility where any such tests or any procedures or activities connected with such tests are or were performed.

(2) Any facility where any new motorcycle which is being, was or is to be tested is present.

(3) Any facility where any construction process or assembly process used in the modification or build-up of such a vehicle into a certification vehicle is taking place or has taken place.

(4) Any facility where any record or other document relating to any of the above is located.

(b) Upon admission to any facility referred to in paragraph (c)(1) of this section, any EPA Enforcement Officer shall be allowed:

(1) To inspect and monitor any part or aspect of such procedures, activities, and testing facilities, including, but not limited to, monitoring vehicle preconditioning, emissions tests and service accumulation, maintenance, and vehicle soak and storage procedures; and to verify correlation or calibration of test equipment;

(2) To inspect and make copies of any such records, designs, or other documents; and

(3) To inspect and/or photograph any part or aspect of any such certification vehicle and any components to be used in the construction thereof.

(c) In order to allow the Administrator to determine whether or not production motorcycles conform in all material respects to the design specifications which applied to those vehicles described in the application for certification for which a certificate of conformity has been issued and to standards prescribed under section 202 of the Act, any manufacturer shall admit any EPA Enforcement Officer on presentation of credentials to both:

(1) Any facility where any document design, or procedure relating to the translation of the design and construction of engines and emission related components described in the application for certification or used for certification testing into production vehicles is located or carried on; and

(2) Any facility where any motorcycles to be introduced into commerce are manufactured or assembled.

(d) On admission to any such facility referred to in paragraph (c)(3) of this section, any EPA Enforcement Officer shall be allowed:

(1) To inspect and monitor any aspects of such manufacture or assembly and other procedures;

(2) To inspect and make copies of any such records, documents or designs; and

(3) To inspect and photograph any part or aspect of any such new motorcycles and any component used in the assembly thereof that are reasonably related to the purpose of his entry.

(e) Any EPA Enforcement Officer shall be furnished by those in charge of a facility being inspected with such reasonable assistance as he may request to help him discharge any function listed in this paragraph. Each applicant for or recipient of certification is required to cause those in charge of a facility operated for its benefit to furnish such reasonable assistance without charge to EPA whether or not the applicant controls the facility.

(f) The duty to admit or cause to be admitted any EPA Enforcement Officer applies whether or not the applicant owns or controls the facility in question and applies both to domestic and to foreign manufacturers and facilities. EPA will not attempt to make any inspections which it has been informed that local law forbids. However, if local law makes it impossible to do what is necessary to insure the accuracy of data generated at a facility, no informed judgment that a vehicle or engine is certifiable or is covered by a certificate can properly be based on that data. It is the responsibility of the manufacturer to locate its testing and manufacturing facilities in jurisdictions where this situation will not arise.

(g) For purposes of this section:

(1) "Presentation of credentials" shall mean display of the document designating a person as an EPA Enforcement Officer.

(2) Where vehicle, component, or engine storage areas or facilities are concerned, "operating hours" shall mean all times during which personnel other than custodial personnel are at work in the vicinity of the area or facility and have access to it.

(3) Where facilities or areas other than those covered by paragraph (g)(2) of this section are concerned, "operating hours" shall mean all times during which an assembly line is in operation or all times during which testing, maintenance, service accumulation, production or compilation of records, or any other procedure or activity related to certification testing, to translation of designs from the test stage to the production stage, or to vehicle manufacture or assembly is being carried out in a facility.

(4) "Reasonable assistance" includes, but is not limited to, clerical, copying, interpretation and translation services, the making available on request of personnel of the facility being inspected during their working hours to inform the EPA Enforcement Officer of how the facility operates and to answer his questions, and the performance on request of emissions tests on any vehicle which is being, has been, or will be used for certification testing. Such tests shall be nondestructive, but may require appropriate service accumulation. A manufacturer may be compelled to cause the personal appearance of any employee at such a facility before an EPA Enforcement Officer by written request for his appearance, signed by the Assistant Administrator for Enforcement, served on the manufacturer. Any such employee who has been instructed by the manufacturer to appear will be entitled to be accompanied, represented, and advised by counsel. No counsel who accompanies, represents, or advises an employee compelled to appear may accompany, represent, or advise any other person in the investigation.

(5) Any entry without 24 hours prior written or oral notification to the affected manufacturer shall be authorized in writing by the Assistant Administrator for Enforcement.

§ 86.442-78 Denial, revocation, or suspension of certification.

(a) Notwithstanding the fact that any certification vehicle(s) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such vehicle(s) if:

(1) The manufacturer submits false or incomplete information in his application for certification thereof; or

(2) The manufacturer renders inaccurate or invalid any test data which he submits pertaining thereto or otherwise circumvents the intent of the Act or of this subpart with respect to such vehicle; or

(3) Any EPA Enforcement Officer is denied access on the terms specified in § 86.441 to any facility or portion thereof which contains any of the following:

(i) The vehicle, or

(ii) Any components used or considered for use in its modification or build-up into a certification vehicle, or

(iii) Any production vehicle which is or will be claimed by the manufacturer to be covered by the certificate, or

(iv) Any step in the construction of a vehicle described in paragraph (c) of this section, or

(v) Any records, documents, reports, or histories required by this Part to be kept concerning any of the above.

(4) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 86.444) in examining any of the items listed in paragraph (a)(1)(iii) of this section.

(b) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraph (a) of this section only when the infraction is substantial.

(c) In any case in which a manufacturer knowingly submits false or inaccurate information, or knowingly renders inaccurate or invalid any test data, or commits any fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void ab initio.

(d) In any case in which certification of a vehicle is proposed to be withheld, denied, revoked, or suspended under paragraph (a) (3) or (4) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.441 in fact occurred, the manufacturer, if the wishes to contend that, even though the violation occurred, the vehicle in question was not involved in the violation to a degree that would warrant withholding, denial, revocation, or suspension of certification under either paragraph (a) (3) or (4) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(e) Any revocation or suspension of certification under paragraph (a) of this section shall:

(1) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.444 hereof.

(2) Extend no further than to forbid the introduction into commerce of vehicles previously covered by the certification which are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes the certification invalid ab initio.

(f) The manufacturer may request in the form and manner specified in § 86.443 that any determination made by the Administrator under paragraph (a) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with § 86.444. If the Administrator finds, after a review of the request and supporting data, that the request raises a substantial factual issue, he will grant the request with respect to such issue.

[42 FR 1126, Jan. 5, 1977, as amended at 42 FR 56738, Oct. 28, 1977]

§ 86.443-78 Request for hearing.

Within 30 days following receipt of notification that an application has been rejected or that certification has been denied, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If, after the review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing with respect to such issue.

§ 86.444-78 Hearings on certification.

(a)(1) After granting a request for a hearing under § 86.443 the Administrator will designate a Presiding Officer for the hearing.

(2) The General Counsel will represent the Environmental Protection Agency in any hearing under this section.

(3) If a time and place for the hearing have not been fixed by the Administrator under § 86.443, the hearing shall be held as soon as practicable at a time and place fixed by the Administrator or by the Presiding Officer.

(4) In the case of any hearing requested pursuant to § 86.437, the Administrator may in his discretion direct that all argument and presentation of evidence be concluded within such fixed period not less than 30 days as he may establish from the date that the first written offer of a hearing is made to the manufacturer. To expedite proceedings, the Administrator may direct that the decision of the Presiding Officer (who may, but need not be the Administrator himself) shall be the final EPA decision.

(b)(1) Upon his appointment pursuant to paragraph (a) of this section, the Presiding Officer will establish a hearing file. The file shall consist of the notice issue by the Administrator under a hearing and the supporting data submitted therewith and all documents relating to the request for certification and all documents submitted therewith, and correspondence and other data material to the hearing.

(2) The appeal file will be available for inspection by the applicant at the office of the Presiding Officer.

(c) An applicant may appear in person, or may be represented by counsel or by any other duly authorized representative.

(d)(1) The Presiding Officer upon the request of any party, or in his discretion, may arrange for a prehearing conference at a time and place specified by him to consider the following:

(i) Simplification of the issues;

(ii) Stipulations, admissions of fact, and the introduction of documents;

(iii) Limitation of the number of expert witnesses;

(iv) Possibility of agreement disposing of all or any of the issues in dispute;

(v) Such other matters as may aid in the disposition of the hearing, including such additional tests as may be agreed upon by the parties.

(2) The results of the conference shall be reduced to writing by the Presiding Officer and made part of the record.

(e)(1) Hearings shall be conducted by the Presiding Officer in an informal but orderly and expeditious manner. The parties may offer oral or written evidence, subject to the exclusion by the Presiding Officer of irrevelant, immaterial, and repetitious evidence.

(2) Witnesses will not be required to testify under oath. However, the Presiding Officer shall call to the attention of witnesses that their statements may be subject to the provisions of Title 18 U.S.C. 1001 which imposes penalties for knowingly making false statements or representations, or using false documents in any matter within the jurisdiction of any department or agency of the United States.

(3) Any witness may be examined or cross-examined by the Presiding Officer, the parties, or their representatives.

(4) Hearings shall be reported verbatim. Copies of transcripts of proceedings may be purchased by the applicant from the reporter.

(5) All written statements, charts, tabulations, and similar data offered in evidence at the hearing shall, upon a showing satisfactory to the Presiding Officer of their authenticity, relevancy, and materiality, be received in evidence and shall constitute a part of the record.

(6) Oral argument may be permitted in the discretion of the Presiding Officer and shall be reported as part of the record unless otherwise ordered by him.

(f)(1) The Presiding Officer shall make an initial decision which shall include written findings and conclusions and the reasons or basis therefore on all the material issues of fact, law, or discretion presented on the record. The findings, conclusions, and written decision shall be provided to the parties and made a part of the record. The initial decision shall become the decision of the Administrator without further proceedings unless there is an appeal to the Administrator or motion for review by the Administrator within 20 days of the date the initial decision was filed.

(2) On appeal from or review of the initial decision the Administrator shall have all the powers which he would have in making the initial decision including the discretion to require or allow briefs, oral argument, the taking of additional evidence or the remanding to the Presiding Officer for additional proceedings. The decision by the Administrator shall include written findings and conclusions and the reasons or basis therefore on all the material issues of fact, law, or discretion presented on the appeal or considered in the review.

Subpart F—Emission Regulations for 1978 and Later New Motorcycles; Test Procedures

SOURCE: 42 FR 1137, Jan. 5, 1977, unless otherwise noted.

§ 86.501-78 Applicability.

(a) This subpart contains the motorcycle test procedures specified in Subpart E.

(b) Provisions of this subpart apply to tests performed by both the Administrator and motor vehicle manufacturers.

§ 86.502-78 Definitions.

(a) The definitions in § 86.402-78 apply to this subpart.

§ 86.503-78 Abbreviations.

(a) The abbreviations in § 86.403-78 apply to this subpart.

§ 86.504-78 Section numbering.

(a) The section numbering system described in § 86.404-78 is used in this subpart.

§ 86.505-78 Introduction; structure of subpart.

(a) This subpart describes the equipment required and the procedures to follow in order to perform exhaust emission tests on motorcycles. Subpart E sets forth the testing requirements and test intervals necessary to comply with EPA certification procedures.

(b) Three topics are addressed in this subpart. Sections 86.508 through 86.515 set forth specifications and equipment requirements; §§ 86.516 through 86.526 discuss calibration methods and frequency; test procedures and data requirements are listed (in approximate order of performance) in §§ 86.527 through 86.544.

§ 86.508-78 Dynamometer.

(a) The dynamometer shall have a single roll with a diameter of at least 0.400 metre.

(b) The dynamometer shall be equipped with a roll revolution counter for measuring actual distance traveled.

(c) Flywheels or other means shall be used to stimulate the inertia specified in § 86.529.

(d) A variable speed cooling blower shall direct air to the vehicle. The blower outlet shall be at least 0.40 m^2 (4.31 ft^2) and shall be squarely positioned between 0.3 m (0.98 ft) and 0.45 m (1.48 ft) in front of the vehicle's front wheel. The velocity of the air at the blower outlet shall be within the following limits (as a function of roll speed):

Actual roll speed	Allowable cooling air speed
0 km/h to 5 km/h	0 km/h to 10 km/h.
5 km/h to 10 km/h	0 km/h to roll speed+5 km/h.
10 km/h to 50 km/h	Roll speed±5 km/h.
50 km/h to 70 km/h	Roll speed±10 pct.
Above 70 km/h	At least 63 km/h.

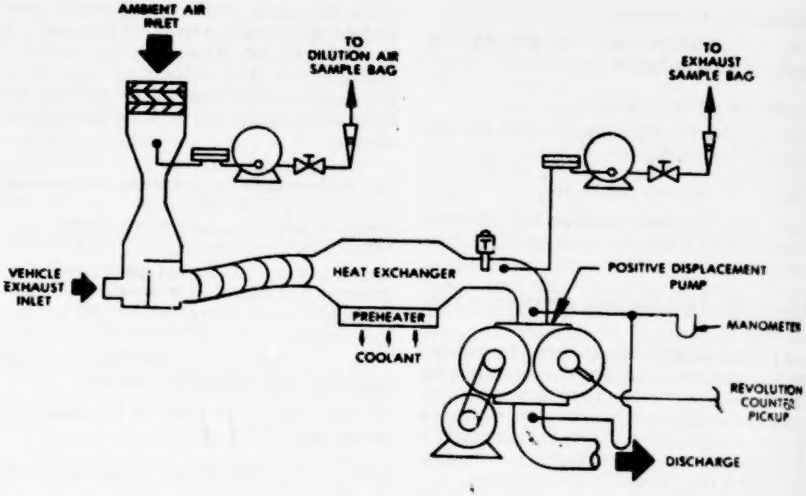
(e) The dynamometer shall comply with the tolerances in § 86.529.

[42 FR 1137, Jan. 5, 1977, as amended at 42 FR 56738, Oct. 28, 1977]

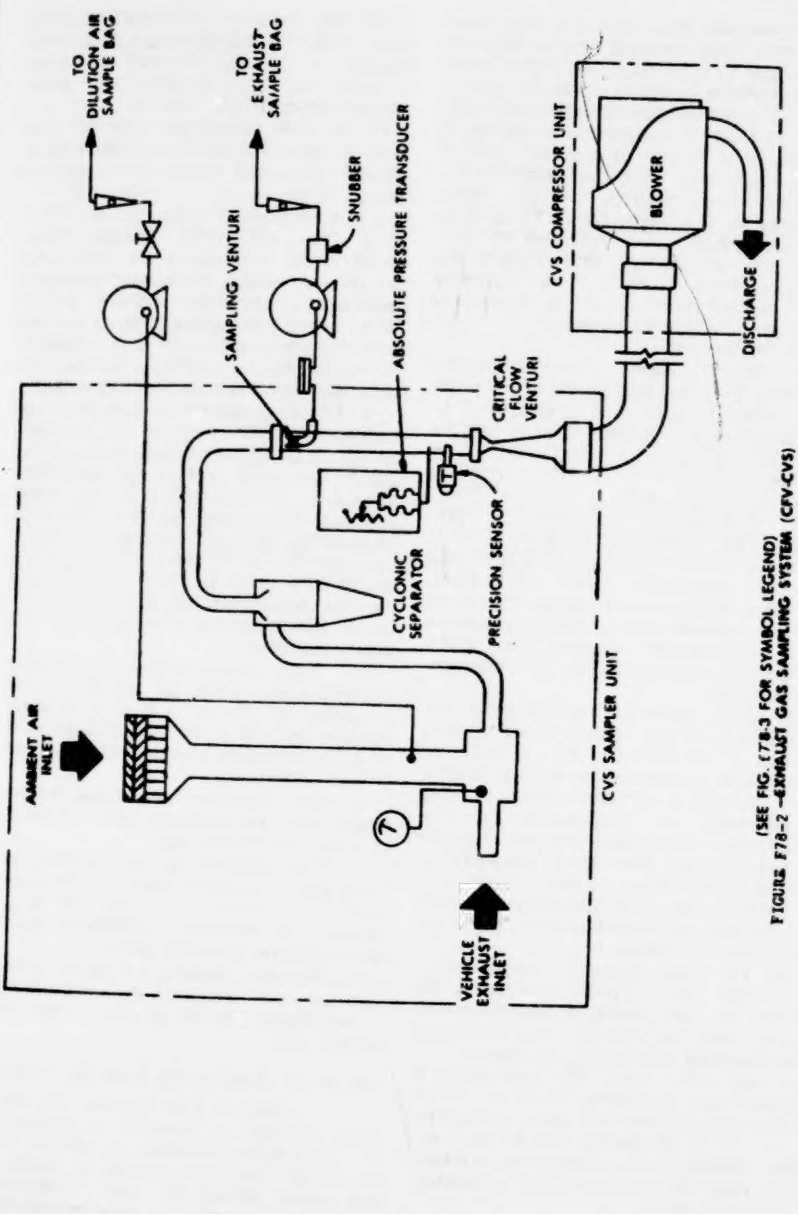
§ 86.509-78 Exhaust gas sampling system.

(a)(1) *General.* The exhaust gas sampling system is designed to measure the true mass emissions of vehicle exhaust. In the CVS concept of measuring mass emissions, two conditions must be satisfied: The total volume of the mixture of exhaust and dilution air must be measured, and a continuously proportioned sample of volume must be collected for analysis. Mass emissions are determined from the sample concentration and totalized flow over the test period.

(2) *Positive Displacement Pump.* The Positive Displacement Pump-Constant Volume Sample (PDP-CVS), Figure F78-1, satisfies the first condition by metering at a constant temperature and pressure through the pump. The total volume is measured by counting the revolutions made by the calibrated positive displacement pump. The proportional sample is achieved by sampling at a constant flow rate.


AMBIENT AIR INLET
TO DILUTION AIR SAMPLE BAG
TO EXHAUST SAMPLE BAG
VEHICLE EXHAUST INLET
HEAT EXCHANGER
PREHEATER
COOLANT
POSITIVE DISPLACEMENT PUMP
MANOMETER
REVOLUTION COUNTER PICKUP
DISCHARGE

(SEE FIG. F78-3 FOR SYMBOL LEGEND)
FIGURE F78-1—EXHAUST GAS SAMPLING SYSTEM (PDP-CVS)


TO DILUTION AIR SAMPLE BAG
TO EXHAUST SAMPLE BAG
SNUBBER
ABSOLUTE PRESSURE TRANSDUCER
SAMPLING VENTURI
CVS COMPRESSOR UNIT
BLOWER
DISCHARGE
CRITICAL FLOW VENTURI
T
PRECISION SENSOR
CYCLONIC SEPARATOR
CVS SAMPLER UNIT
AMBIENT AIR INLET
T
VEHICLE EXHAUST INLET

(SEE FIG. F78-3 FOR SYMBOL LEGEND)

FIGURE F78-2—EXHAUST GAS SAMPLING SYSTEM (CFV-CVS)

(3) *Critical Flow Venturi.* The operation of the Critical Flow Venturi-Constant Volume Sampler (CFV-CVS), Figure F78-2, is based upon the principles of fluid dynamics associated with critical flow. Proportional sampling is maintained by use of a small CFV in the sample line, which responds to the varying temperatures in the same manner as the main CFV. Total flow per test phase is determined by continuously computing and integrating instantaneous flow. A low response time temperature sensor is necessary for accurate flow calculation.

(4) [Reserved]

(5) *Other systems.* Other sampling systems may be used if shown to yield equivalent results, and if approved in advance by the Administrator (e.g., a heat exchanger with the CFV-CVS or an electronic flow integrator without a heat exchanger, with the PDP-CVS).

(b) *Component description, PDP-CVS.* The PDP-CVS, Figure F78-1, consists of a dilution air filter and mixing assembly, heat exchanger, positive displacement pump, sampling system, and associated valves, pressure and temperature sensors. The PDP-CVS shall conform to the following requirements:

(1) Static pressure variations at the tailpipe(s) of the vehicle shall remain within ±1.25 kPa (±5.02 in. H_2O) of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). (Sampling systems capable of maintaining the static pressure to within ±0.25 kPa (±1.00 in H_2O) will be used by the Administrator if a written request substantiates the need for this closer tolerance.)

(2) The gas mixture temperature, measured at a point immediately ahead of the positive displacement pump, shall be within ±5° C (9° F) of the designed operating temperature at the start of the test. The gas mixture temperature variation from its value at the start of the test shall be limited to ±5° C (9° F) during the entire test. The temperature measuring system shall have an accuracy and precision of ±1° C (1.8° F).

(3) The pressure gauges shall have an accuracy and precision of ±0.4 kPa (3 mm Hg).

(4) The location of the dilution air inlet shall be placed and the flow capacity of the CVS snall be large enough to virtually eliminate water condensation in the system.

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow.

(c) *Component description, CFV-CVS.* The CFV-CVS, Figure F78-2, consists of a dilution air filter and mixing assembly, cyclone particulate separator, sampling venturi, critical flow venturi, sampling system, and assorted valves, pressure and temperature sensors. The CFV-CVS shall conform to the following requirements:

(1) Static pressure variations at the tailpipe(s) of the vehicle shall remain within ±1.25 kPa (5.02 in H_2O) of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). (Sampling systems capable of maintaining the static pressure to within ±0.25 kPa (1.00 in H_2O) will be used by the Administrator if a written request substantiates the need for this closer tolerance.)

(2) The temperature measuring system shall have an accuracy and precision of ±1° C (1.8° F) and a response time of 0.100 s to 62.5 percent of a temperature change (as measured in hot silicone oil).

(3) The pressure measuring system shall have an accuracy and precision of ±0.4 kPa (3 mm Hg).

(4) The location of the dilution air inlet shall be placed and the flow capacity of the CVS shall be large enough to virtually eliminate water condensation in the system.

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow.

§ 86.509-90 Exhaust gas sampling system.

(a)(1) *General.* The exhaust gas sampling system is designed to measure the true mass emissions of vehicle exhaust. In the CVS concept of measuring mass emissions, two conditions must be satisfied: the total volume of the mixture of exhaust and dilution air must be measured and a continuously proportioned volume of sample must be collected for analysis. Mass emissions are determined from the sample concentration and totalized flow over the test period.

(2) *Vehicle tailpipe to CVS duct.* For methanol fueled vehicles, cooling of the exhaust gases in the duct connecting the vehicle tailpipe to the CVS shall be minimized. This may be accomplished by:

(i) Using a duct of unrestricted length maintained at 113°±8 °C (235°±15 °F), heating and possibly cooling capabilities are required; or

(ii) Using a short max. length) duct (up to 12 feet long) constructed of smooth wall pipe with a minimum of flexible sections, maintained at 112°±8 °C (235°±15 °F) prior to the test and during any breaks in the test and uninsulated during the test (insulation may remain in place and/or heating may occur during testing provided maximum temperature is not exceeded); or

(iii) Using a smooth wall duct less than five feet long with no required heating; or

(iv) Omitting the duct and performing the exhaust gas dilution function at the motorcycle tailpipe exit.

(3) *Positive Displacement Pump.* The Positive Displacement Pump-Constant Volume Sampler (PDP-CVS), Figure F90-1, satisfies the first condition by metering at a constant temperature and pressure through the pump. The total volume is measured by counting the revolutions made by the calibrated positive displacement pump. The proportional samples are achieved by sampling at a constant flow rate. For methanol-fueled motorcycles only, the sample lines for the methanol and formaldehyde samples are heated to 113±8 °C (235±15 °F) Note: For 1990 through 1994 model year methanol-fueled motorcycles, methanol and formaldehyde sampling may be omitted provided the bag sample is analyzed using a HFID calibrated with methanol.

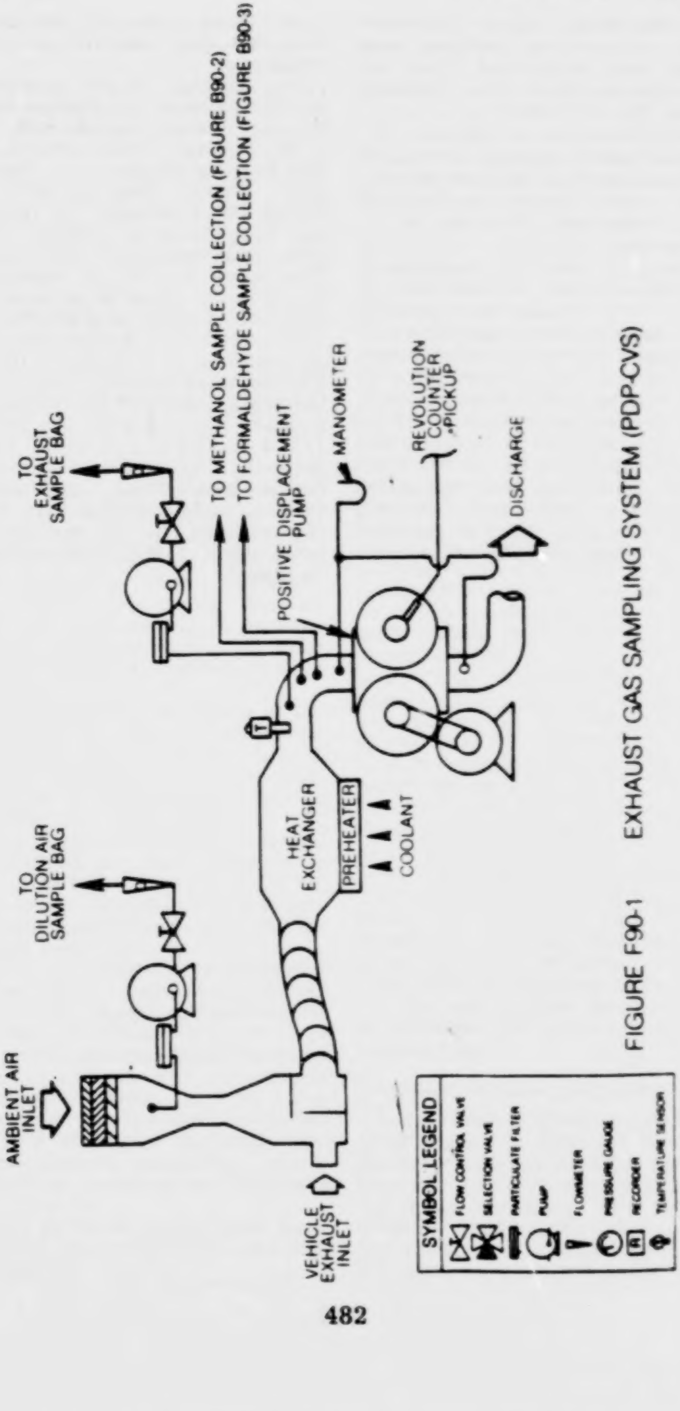

AMBIENT AIR INLET
TO DILUTION AIR SAMPLE BAG
TO EXHAUST SAMPLE BAG
TO METHANOL SAMPLE COLLECTION (FIGURE B90-2)
TO FORMALDEHYDE SAMPLE COLLECTION (FIGURE B90-3)
HEAT EXCHANGER
PREHEATER
COOLANT
T
POSITIVE DISPLACEMENT PUMP
MANOMETER
REVOLUTION COUNTER PICKUP
DISCHARGE
VEHICLE EXHAUST INLET
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
R
RECORDER
TEMPERATURE SENSOR

FIGURE F90-1 EXHAUST GAS SAMPLING SYSTEM (PDP-CVS)

(4) *Critical Flow Venturi.* The operation of the Critical Flow Venturi-Constant Volume Sampler (CFV-CVS), Figure F90-2, is based upon the principles of fluid dynamics associated with critical flow. Proportional sampling is maintained by use of small CFVs in the sample lines, which responds to the varying temperatures in the same manner as the main CFV. For methanol-fueled motorcycles, the sample lines (methanol and formaldehyde) are heated to 113±8 °C (235±15 °F). Care must be taken to prevent heating of the small CFVs in the sample probe because heating would cause loss of proportionality. Note: For 1990 through 1994 model year methanol-fueled motorcycles, methanol and formaldehyde sampling may be omitted provided the bag sample is analyzed using a HFID calibrated with methanol. Total flow per test phase is determined by continuously computing and integrating instantaneous flow. A low response time temperature sensor is necessary for accurate flow calculation.

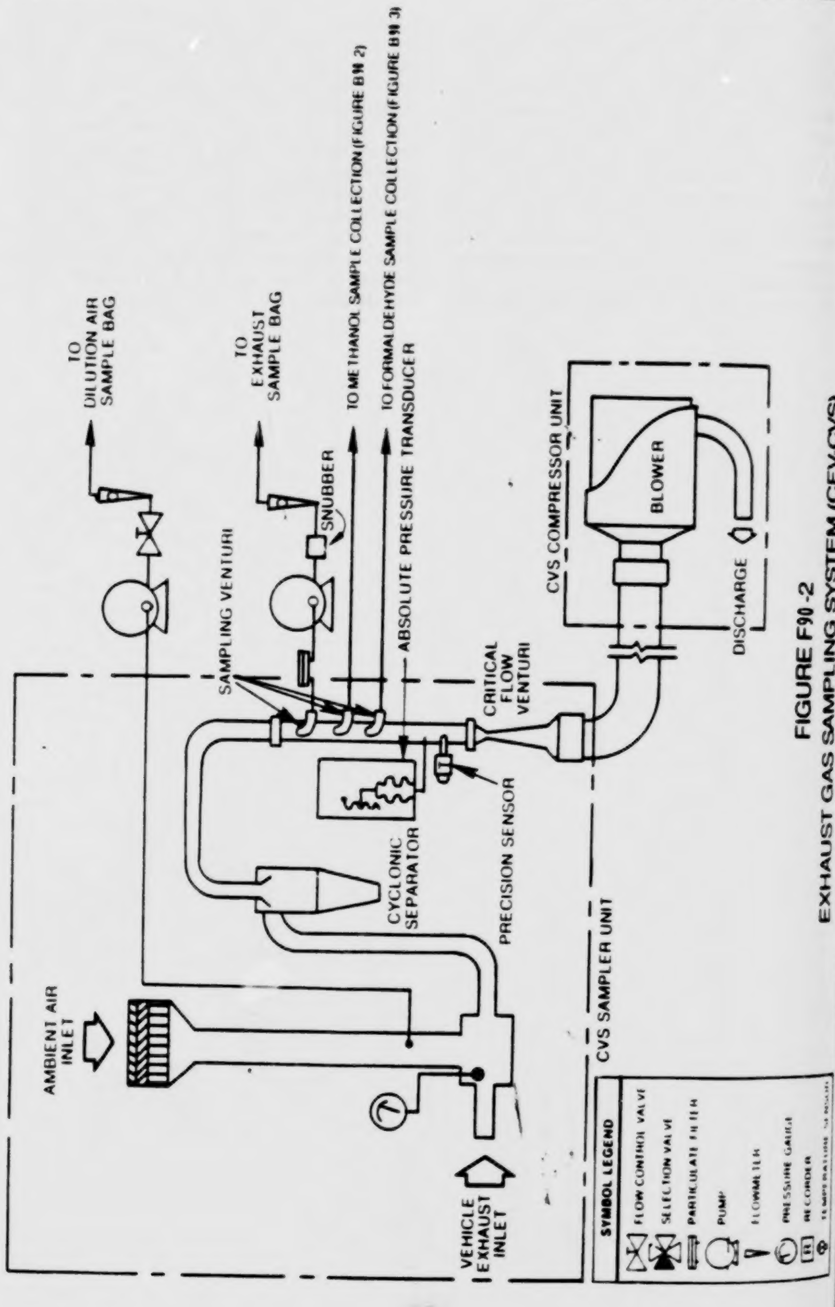

TO DILUTION AIR SAMPLE BAG
TO EXHAUST SAMPLE BAG
TO METHANOL SAMPLE COLLECTION (FIGURE B11 2)
TO FORMALDEHYDE SAMPLE COLLECTION (FIGURE B11 3)
ABSOLUTE PRESSURE TRANSDUCER
SNUBBER
SAMPLING VENTURI
SAMPLING VENTURI
CRITICAL FLOW VENTURI
CVS COMPRESSOR UNIT
BLOWER
DISCHARGE
AMBIENT AIR INLET
CYCLONIC SEPARATOR
PRECISION SENSOR
CVS SAMPLER UNIT
VEHICLE EXHAUST INLET
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
RECORDER
TEMPERATURE SENSOR

FIGURE F90-2

EXHAUST GAS SAMPLING SYSTEM (CFV-CVS)

(5) [Reserved]

(6) *Other systems.* Other sampling systems may be used if shown to yield equivalent results, and if approved in advance by the Administrator (*e.g.*, a heat exchanger with the CFV-CVS or an electronic flow integrator without a heat exchanger, with the PDP-CVS).

(b) *Component description, PDP-CVS.* The PDP-CVS, Figure F90-1, consists of a dilution air filter and mixing assembly, heat exchanger, positive displacement pump, sampling systems including, probes and sampling lines which in the case of the methanol-fueled motorcycles, are heated to 113±8 °C (235±15 °F) (heating of the sample lines may be omitted provided the methanol and formaldehyde sample collection systems are close coupled to the probes thereby preventing loss of sample due to resulting condensation in the sample lines) and associated valves, pressure and temperature sensors. The PDP-CVS shall conform to the following requirements:

(1) Static pressure variations at the tailpipe(s) of the vehicle shall remain within ±1.25 kPa (±5.02 in H_2O) of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). (Sampling systems capable of maintaining the static pressure to within ±0.25 kPa (±1.00 in. H_2O) will be used by the Administrator if a written request substantiates the need for this closer tolerance.)

(2) The gas mixture temperature, measured at a point immediately ahead of the positive displacement pump, shall be within ±5°C (9 °F) of the designed operating temperature at the start of the test. The gas mixture temperature variation from its value at the start of the test shall be limited to ±5 °C (9 °F) during the entire test. The temperature measuring system shall have an accuracy and precision of ±1 °C (1.8 °F).

(3) The pressure gauges shall have an accuracy and precision of ±0.4 kPa (±3 mm Hg).

(4) The location of the dilution air inlet shall be placed so as to use test-cell air for dilution air and the flow capacity of the CVS shall be large enough to eliminate water condensation in the system. Control of water condensation with methanol-fueled vehicles is critical. Procedures for determining CVS flow rates are detailed in "Calculation of Emissions and Fuel Economy When Using Alternative Fuels," EPA 460/3-83-009.

(5) Sample collection bags for dilution air and exhaust samples (hydrocarbon and carbon monoxide) shall be of sufficient size so as to not impede sample flow. A single dilution air sample covering the total test period may be collected for determination of formaldehyde background (methanol-fueled motorcycles).

(6) The methanol sample collection system and the formaldehyde sample collection system shall each be of sufficient size so as to collect samples of adequate size for analysis without significant impact on the volume of dilute exhaust passing through the PDP.

(c) *Component description, CFV-CVS.* The CFV-CVS, Figure F90-2, consists of a dilution air filter and mixing assembly, cyclone particulate separator, unheated sampling venturies for the bag, and for methanol-fueled motorcycles the methanol and formaldehyde samples, sample lines (heated to 113°± °C (235°±15 °F) for the methanol and formaldehyde samples from methanol-fueled motorcycles (heating of sample lines may be omitted provided, the methanol and formaldehyde sample collection systems are close coupled to the probes thereby preventing loss of sample due to cooling and resulting condensation in the sample line), critical flow venturi, and assorted valves, pressure and temperature sensors. The CFV-CVS shall conform to the following requirements:

(1) Static pressure variations at the tailpipe(s) of the vehicle shall remain within ±1.25 kPa (5.02 in H_2O) of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). (Sampling systems capable of maintaining the static pressure to within ±0.25 kPa (1.00 in H_2O) will be used by the Administrator if a written request substantiates the need for this closer tolerance.)

(2) The temperature measuring system shall have an accuracy and precision of ±1 °C (1.8 °F) and a response time of 0.100 second to 62.5 percent of a temperature change (as measured in hot silicone oil).

(3) The pressure measuring system shall have an accuracy and precision of ±0.4 kPa (±3 mm Hg).

(4) The location of the dilution air inlet shall be placed so as to use test-cell air for dilution air and the flow capacity of the CVS shall be large enough to virtually eliminate water condensation in the system. Control of water condensation with methanol fueled vehicles is critical. Procedures for determining CVS flow rates are detailed in "Calculation of Emissions And Fuel Economy When Using Alternate Fuels," EPA 460/3-83-009.

(5) Sample collection bags (hydrocarbon monoxide) for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow. A single dilution air sample covering the total test period may be collected for determination of formaldehyde background for methanol-fueled motorcycles.

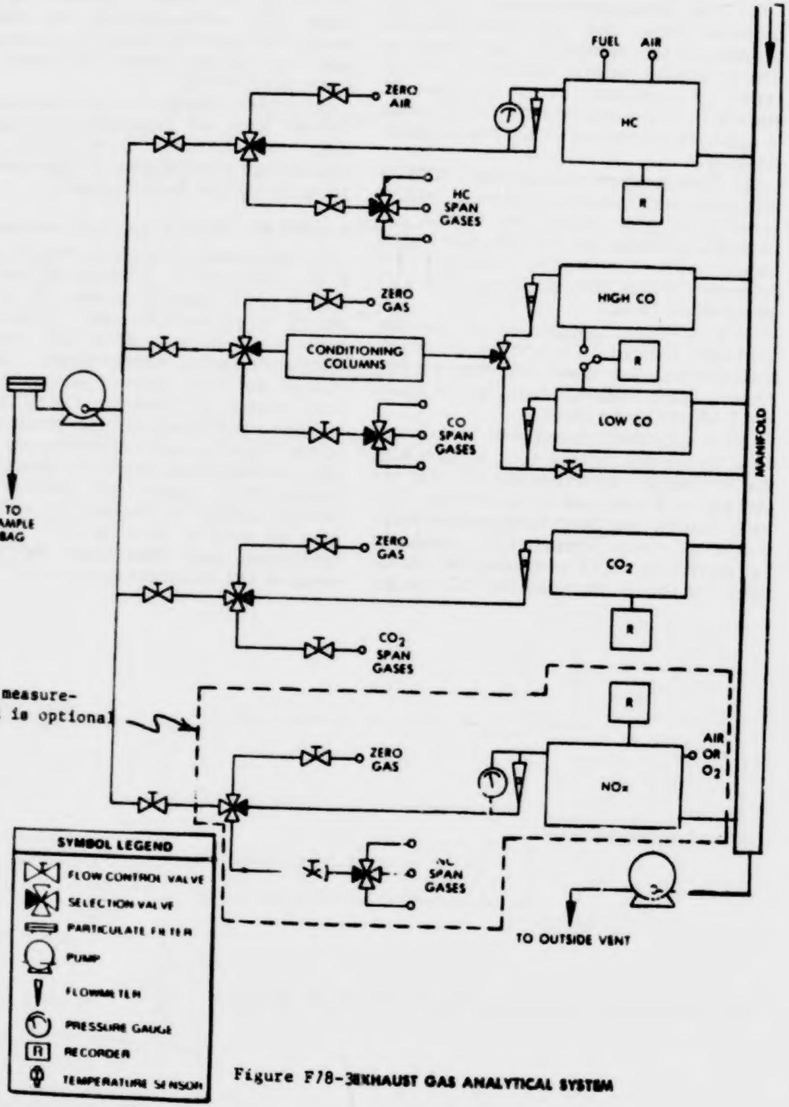
(6) The methanol sample collection system and the formaldehyde sample collection system shall each be of sufficient size so as to collect samples of adequate size for analysis without significant impact on the volume of dilute exhaust passing thorough the CVS.

[54 FR 14539, Apr. 11, 1989]

§ 86.511-78 Exhaust gas analytical system.

(a) *Schematic drawing.* Figure F78-3 is a schematic drawing of the exhaust gas analytical system. Since various configurations can produce accurate results, exact conformance with this drawing is not required. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems.

(b) *Major component description.* The analytical system, Figure F78-3, consists of a flame ionization detector (FID) for the determination of hydrocarbons, nondispersive infrared analyzers (NDIR) for the determination of carbon monoxide and carbon dioxide, and, if oxides of nitrogen are measured, a chemiluminescence analyzer (CL) for the determination of oxides of nitrogen. The exhaust gas analytical system shall conform to the following requirements:


FUEL
AIR
ZERO AIR
HC
R
HC SPAN GASES
ZERO GAS
HIGH CO
CONDITIONING COLUMNS
R
LOW CO
CO SPAN GASES
TO SAMPLE BAG
ZERO GAS
CO$_2$
R
CO$_2$ SPAN GASES
MANIFOLD
R
ZERO GAS
AIR OR O$_2$
NOx
NO SPAN GASES
TO OUTSIDE VENT
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
RECORDER
TEMPERATURE SENSOR

NOx measurement is optional

Figure F78-3 EXHAUST GAS ANALYTICAL SYSTEM

(1) The chemiluminescence analyzer requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(2) The carbon monoxide (NDIR) analyzer may require a sample conditioning column containing $CaSO_4$, or indicating silica gel to remove water vapor and containing ascarite to remove carbon dioxide from the CO analysis stream.

(i) If CO instruments which are essentially free of CO_2 and water vapor interference are used, the use of the conditioning column may be deleted, see § 86.522 and § 86.544.

(ii) A CO instrument will be considered to be essentially free of CO_2 and water vapor interference if its response to a mixture of 3 percent CO_2 in N_2 which has been bubbled through water at room temperature produces an equivalent CO response, as measured on the most sensitive CO range, which is less than 1 percent of full scale CO concentration on ranges above 300 ppm full scale or less than 3 ppm on ranges below 300 ppm full scale, see § 86.522.

(c) *Other analyzers and equipment.* Other types of analyzers and equipment may be used if shown to yield equivalent results and if approved in advance by the Administrator.

§ 86.511-90 Exhaust gas analytical system.

(a) *Schematic drawings.* Figure F90-3 is a schematic drawing of the exhaust gas analytical system for analysis of hydrocarbons (HC) (hydrocarbons plus methanol in the case of methanol-fueled motorcycles), carbon monoxide (CO), carbon dioxide (CO_2), and oxides of nitrogen (NO_x). Since various configurations can produce accurate results, exact conformance with the drawing is not required. Additional components such as instruments, valves, solenoids, pumps and switches may be used to provide additional information and coordinate the functions of the component systems

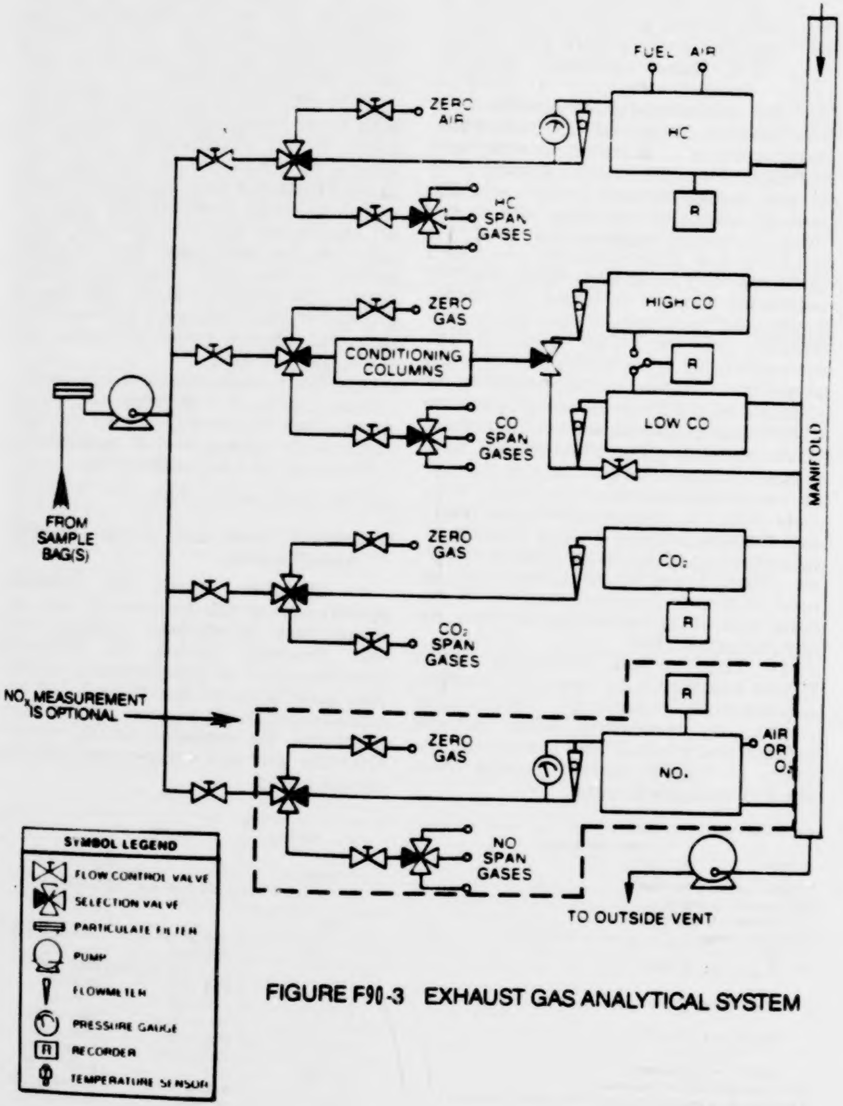

FUEL
AIR
ZERO AIR
HC
R
HC SPAN GASES
ZERO GAS
HIGH CO
CONDITIONING COLUMNS
R
LOW CO
CO SPAN GASES
FROM SAMPLE BAG(S)
ZERO GAS
CO_2
R
CO_2 SPAN GASES
MANIFOLD
NO_x MEASUREMENT IS OPTIONAL
R
ZERO GAS
NO_x
AIR OR O_2
NO SPAN GASES
TO OUTSIDE VENT
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
RECORDER
TEMPERATURE SENSOR

FIGURE F90-3 EXHAUST GAS ANALYTICAL SYSTEM

(b) *Major component description.* The exhaust gas analytical system for HC, CO and CO$_2$, Figure F90-3, consists of a flame ionization detector (FID) (heated (235°±15 °C (113°±8 °C)) for methanol-fueled vehicles) for the determination of hydrocarbons, nondispersive infrared analyzers (NDIR) for the determination of carbon monoxide and carbon dioxide and, if oxides of nitrogen are measured, a chemiluminescence analyzer (CL) for the determination of oxides of nitrogen. The analytical system for methanol consists of a gas chromatograph (GC) equipped with a flame ionization detector. The analysis for formaldehyde is performed using high pressure liquid chromatography (HPLC) of 2,4-dinitrophenylhydrazine (DNPH) derivatives using ultraviolet (UV) detection. The exhaust gas analytical system shall conform to the following requirements:

(1) The CL requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(2) The carbon monoxide (CO) NDIR analyzer may require a sample conditioning column containing CaSO$_4$, or indicating silica gel to remove water vapor and containing ascarite to remove carbon dioxide from the CO analysis stream.

(i) If CO instruments which are essentially free of CO$_2$ and water vapor interference are used, the use of the conditioning column may be deleted, see §§ 86.522 and 86.544.

(ii) A CO instrument will be considered to be essentially free of CO$_2$ and water vapor interference if its response to a mixture of 3 percent CO$_2$ in N$_2$ which has been bubbled through water at room temperature produces an equivalent CO response, as measured on the most sensitive CO range, which is less than 1 percent of full scale CO concentration on ranges above 300 ppm full scale or less than 3 ppm on ranges below 300 ppm full scale; *see* § 86.522.

(c) *Other analyzers and equipment.* Other types of analyzers and equipment may be used if shown to yield equivalent results and if approved in advance by the Administrator.

[54 FR 14544, Apr. 11, 1989]

§ 86.513-82 Fuel and engine lubricant specifications.

(a) Gasoline having the following specifications will be used by the Administrator in exhaust emission testing. Gasoline having the following specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer for emission testing except that the lead and octane specifications do not apply.

Item designation	ASTM	Leaded	Unleaded
Octane, research, minimum	D2699	100	96.
PB (organic), grams/litre		0.370 (1.4) min	0.000-0.013.
(grams/U.S. gallon)			(0.00-0.05).
Distillation Range	D86		
IBP, °C (°F)		23.9-35 (75-95)	23.9-35 (75-95)
10 pct point, °C (°F)		48.9-57.2	48.9-57.2.
		(120-135)	(120-135).
50 pct point, °C (°F)		93.3-110	93.3-110.
		(200-230)	(200-230).
90 pct point, °C (°F)		148.9-162.8	148.9-162.8.
		(300-325)	(300-325).
EP, °C (°F) (maximum)		212.8 (415)	212.8 (415).
Sulfur, weight percent, maximum	D1266	0.10	0.10.
Phosphorus, grams/litre (grams/U.S. gallon), maximum,		0.0026 (0.01)	0.0013 (0.005).
RVP, KPa (psi)	D323	55.2-63.4	55.2-63.4
		(8.0-9.2)	(8.0-9.2).
Hydrocarbon composition:			
Olefins, percent, maximum	D1319	10	10.
Aromatics, percent maximum		35	35.
Saturates		Remainder	Remainder.

(b) Gasoline and engine lubricants representative of commercial fuels and engine lubricants which will be generally available through retail outlets shall be used in service accumulation. For leaded fuel the minimum lead content shall be equal to the average lead content found in regular leaded gasoline in the fuel survey prescribed by the Administrator. Where the Administrator determines that vehicles represented by a test vehicle will be operated using gasoline of different lead content than that prescribed in this paragraph, he may consent in writing to use a gasoline with a different lead content. The octane rating of the gasoline used shall be no higher than 4.0 research octane numbers above the minimum recommended by the manufacturer. The Reid Vapor Pressure of the fuel used shall be characteristic of the motor fuel during the season which the service accumulation takes place. If the manufacturer specifies several lubricants to be used by the ultimate purchaser, the Administrator will select one to be used during service accumulation.

(c) The specification range of the fuels and engine lubricants to be used under paragraph (b) of this section shall be reported in accordance with § 86.416.

(d) The same lubricant(s) shall be used for both service accumulation and emission testing.

(e) Fuels not meeting the specifications set forth in this section may be used only with the advance approval of the Administrator.

[46 FR 50496, Oct. 13, 1981, and 47 FR 49807, Nov. 2, 1982]

§ 86.513–87 Fuel and engine lubricant specifications.

(a) Gasoline having the following specifications will be used by the Administrator in exhaust emission testing. Gasoline having the following specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer for emission testing except that the lead and octane specifications do not apply.

Item designation	ASTM	Leaded	Unleaded
Octane, research, min	D2699	100	93
Pb (organic), g/liter (g/U.S. gal.)	D3237	[1] 0.026 (0.100 max)	[1] 0.013 (0.050 max)
Distillation Range:	D86		
IBP, °C(°F)		23.9–35 (75–95)	23.9–35 (75–95)
10 pct. point, °C(°F)		48.9–57.2 (120–135)	48.9–57.2 (120–135)
50 pct. point, °C(°F)		93.3–110 (200–230)	93.3–110 (200–230)
90 pct. point, °C(°F)		148.9–162.8 (300–325)	148.9–162.8 (300–325)
EP, °C(°F)		212.8(415)	212.8(415)
Sulfur, wt. pct., max	D1266	0.10	0.10
Phosphorus, g/liter (g/U.S. gal), max		0.0026 (0.01)	0.0013 (0.005)
RVP, KPa (psi)	D323	55.2–63.4 (8.0–9.2)	55.2–63.4 (8.0–9.2)
Hydrocarbon composition:			
Olefins, pct., max	D1319	10	10
Aromatics, pct., max		35	35
Saturates		([2])	([2])

[1] Maximum.

[2] Remainder.

(b)(1) Gasoline and engine lubricants representative of commercial fuels and engine lubricants which will be generally available through retail outlets shall be used in service accumulation.

(2) For leaded fuel the lead content shall not exceed 0.100 gram lead per gallon leaded gasoline.

(3) Where the Administrator determines that vehicles represented by a test vehicle will be operated using gas-

oline of different lead content than that prescribed in this paragraph, he may consent in writing to use a gasoline with a different lead content.

(4) The octane rating of the gasoline used shall be no higher than 4.0 research octane numbers above the minimum recommended by the manufacturer.

(5) The Reid Vapor Pressure of the fuel used shall be characteristic of the motor fuel during the season in which the service accumulation takes place.

(6) If the manufacturer specifies several lubricants to be used by the ultimate purchaser, the Administrator will select one to be used during service accumulation.

(c) The specification range of the fuels and engine lubricants to be used under paragraph (b) of this section shall be reported in accordance with § 86.416.

(d) The same lubricant(s) shall be used for both service accumulation and emission testing.

(e) Fuels not meeting the specifications set forth in this section may be used only with the advance approval of the Administrator.

[51 FR 24611, July 7, 1986, as amended at 52 FR 47869, Dec. 16, 1987]

§ 86.513–90 Fuel and engine lubricant specifications.

(a) Gasoline having the following specifications will be used by the Administrator in exhaust emission testing. Gasoline having the following specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer for emission testing except that the octane specifications do not apply.

Item	ASTM	Value
Octane, research, . minimum.	D2699	96
Lead (organic):		
g/liter	D3237	[1] 0.013
(g/U.S. gal.)		[1] (0.050)
Distillation range:		
IBP:		
°C	D86	23.9–35
(°F)		(75–95)
10 pct. point:		
°C	D86	48.9–57.2
(°F)		(120–135)
50 pct. point:		
°C	D86	93.3–110
(°F)		(200–230)
90 pct. point:		
°C	D86	148.9–162.8
(°F)		(300–325)
EP:		
°C max	D86	212.8
(°F)		(415)
Sulfur, weight percent, maximum.	D1266	0.10
Phosphorus:		
g/liter, max	D3231	0.0013
(g/U.S. gal)		(0.005)
RVP, kPa (psi)	D323	55.2–63.4 (8.0–9.2)
Hydrocarbon composition:		
Olefins, percent, maximum.	D1319	10
Aromatics, percent, maximum.	D1319	35
Saturates	D1319	Remainder

[1] Maximum.

(b)(1) Unleaded gasoline and engine lubricants representative of commercial fuels and engine lubricants which will be generally available through retail outlets shall be used in service accumulation.

(2) The octane rating of the gasoline used shall be no higher than 4.0 Research octane numbers above the minimum recommended by the manufacturer.

(3) The Reid Vapor Pressure of the fuel used shall be characteristic of the motor fuel during the season in which the service accumulation takes place.

(4) If the manufacturer specifies several lubricants to be used by the ultimate purchaser, the Administrator will select one to be used during service accumulation.

(c) Methanol fuel used for exhaust and evaporative emission testing and in service accumulation of methanol-fueled motorcycle vehicles shall be representative of commercially available methanol fuel and shall consist of at least 50 percent methanol by volume.

(1) Manufacturers shall recommend the methanol fuel to be used for testing and service accumulation in accordance with paragraph (c).

(2) The Administrator shall determine the methanol fuel to be used for testing and service accumulation.

(d) Other methanol fuels may be used for testing and service accumulation provided:

(1) They are commercially available, and

(2) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(3) Use of a fuel listed under paragraph (a)(3) of this section would have a detrimental effect on emissions or durability, and

(4) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(e) The specification range of the fuels and engine lubricants to be used under paragraph (b) of this section shall be reported in accordance with § 86.416.

(f) The same lubricant(s) shall be used for both service accumulation and emission testing.

(g) Fuels not meeting the specifications set forth in this section may be used only with the advance approval of the Administrator.

(h) *Mixtures of petroleum and methanol fuels for flexible fuel motorcycles.* (1) Mixtures of petroleum and methanol fuels used for exhaust and evaporative emission testing and service accumulation for flexible fuel motorcycles shall be within the range of fuel mixtures for which the vehicle was designed.

(2) Manufacturer testing and service accumulation may be performed using only those mixtures (mixtures may be different for exhaust testing, evaporative testing, and service accumulation) expected to result in the highest emissions, provided:

(i) The fuels which constitute the mixture will be used in customer service, and

(ii) Information, acceptable to the Administrator, is provided by the manufacturer to show that the designated fuel mixtures would result in the highest emissions, and

(iii) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(3) The specification range of the fuels to be used under paragraph (h)(1) of this section shall be reported in accordance with § 86.090 21(b)(3).

[53 FR 476, Jan. 7, 1988, as amended at 54 FR 14546, Apr. 11, 1989]

§ 86.514–78 Analytical gases.

(a) Analyzer gases.

(1) Gases for the CO and CO_2 analyzers shall be single blends of CO and CO_2 respectively using nitrogen as the diluent.

(2) Gases for the hydrocarbon analyzer shall be single blends of propane using air as the diluent.

(3) Gases for the NOx analyzer shall be single blends of NO named as NOx with a maximum NO_2 concentration of 5 percent of the nominal value using nitrogen as the diluent.

(4) [Reserved]

(5) The allowable zero gas (air or nitrogen) impurity concentrations shall not exceed 1 ppm equivalent carbon response, 1 ppm carbon monoxide, 0.04 percent (400 ppm) carbon dioxide, and 0.1 ppm nitric oxide.

(6) "Zero grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

(7) The use of proportioning and precision blending devices to obtain the required analyzer gas concentrations is allowable provided their use has been approved in advance by the Administrator.

(b) Calibration gases shall be known to within ±2 percent of the true values.

§ 86.515–78 EPA Urban Dynamometer Driving Schedule.

(a) The dynamometer driving schedules are listed in Appendix I. The driving schedules are defined by a smooth trace drawn through the specified speed vs. time relationships. They consist of a nonrepetitive series of idle, acceleration, cruise, and deceleration modes of various time sequences and rates. Appropriate driving schedules are as follows:

Class I—Appendix I(c)
Class II—Appendix I(b)
Class III—Appendix I(b)

(b) The speed tolerance at any given time on the dynamometer driving schedule prescribed in Appendix I or as printed on a driver's aid chart approved by the Administrator, when conducted to meet the requirements of § 86.537 is defined by upper and lower limits. The upper limit is 3.2 km/h (2 mph) higher than the highest point on the trace within 1 second of the given time. The lower limit is 3.2 km/h (2 mph) lower than the lowest point on the trace within 1 second of the given time. Speed variations greater than the tolerances (such as may occur during gear changes) are acceptable provided they occur for less than 2 seconds on any occasion. Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power during such occurrences. When conducted to meet the requirements of § 86.532 the speed tolerance shall be as specified above, except that the upper and lower limits shall be 6.4 km/h (4 mph).

(c) Figure F78-4 shows the range of acceptable speed tolerances for typical points. Figure F78-4(a) is typical of portions of the speed curve which are increasing or decreasing throughout the two second time interval. Figure F78-4(b) is typical of portions of the speed curve which include a maximum or minimum value.

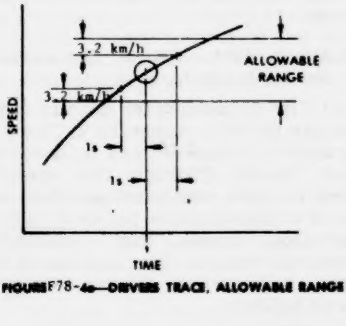


FIGURE F78-4a—DRIVERS TRACE, ALLOWABLE RANGE

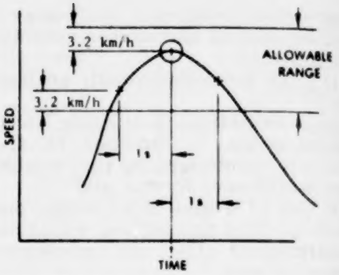


FIGURE F78-4b—DRIVERS TRACE, ALLOWABLE RANGE

§ 86.516-78 Calibrations, frequency and overview.

(a) Calibrations shall be performed as specified in §§ 86.517 through 86.526.

(b) [Reserved]

(c) At least monthly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Calibrate the hydrocarbon analyzer, carbon dioxide analyzer, carbon monoxide analyzer, and, if oxides of nitrogen are measured, oxides of nitrogen analyzer.

(2) *Calibrate the dynamometer.* If the dynamometer receives a weekly performance check (and remains within calibration), the monthly calibration need not be performed.

(d) At least weekly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Check the oxides of nitrogen converter efficiency, if oxides of nitrogen are measured, and

(2) Perform a CVS system verification, and

(3) Run a performance check on the dynamometer. This check may be omitted if the dynamometer has been calibrated within the preceding month.

(e) The CVS positive displacement pump or Critical Flow Venturi shall be calibrated following initial installation, major maintenance or as necessary when indicated by the CVS system verification (described in § 86.519).

(f) Sample conditioning columns, if used in the CO analyzer train, should be checked at a frequency consistent with observed column life or when the indicator of the column packing begins to show deterioration.

[54 FR 14546, Apr. 11, 1989]

§ 86.516-90 Calibrations, frequency and overview.

(a) Calibrations shall be performed as specified in §§ 86.517 through 86.526.

(b) [Reserved]

(c) At least monthly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Calibrate the hydrocarbon analyzer, carbon dioxide analyzer, carbon monoxide analyzer, methanol analyzer, formaldehyde analyzer and, if oxides of nitrogen are measured, oxides of nitrogen analyzer (certain analyzers may require more frequent calibration depending on particular equipment and uses).

(2) Calibrate the dynamometer. If the dynamometer receives a weekly performance check (and remains within calibration), the monthly calibration need not be performed.

(d) At least weekly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Check the oxides of nitrogen converter efficiency, if oxides of nitrogen are measured, and

(2) Perform a CVS system verification, and

(3) Run a performance check on the dynamometer. This check may be omitted if the dynamometer has been calibrated within the preceding month.

(e) The CVS positive displacement pump or Critical Flow Venturi shall be calibrated following initial installation, major maintenance or as necessary when indicated by the CVS system verification (described in § 86.519).

(f) Sample conditioning columns, if used in the CO analyzer train, should be checked at a frequency consistent with observed column life or when the indicator of the column packing begins to show deterioration.

[54 FR 14546, Apr. 11, 1989]

§ 86.518-78 Dynamometer calibration.

(a) The dynamometer shall be calibrated at least once each month or performance verified at least once each week and then calibrated as required. The dynamometer is driven above the test speed range. The device used to drive the dynamometer is then disengaged from the dynamometer and the roll is allowed to coast down. The kinetic energy of the system is dissipated by the dynamometer. This method neglects the variations in roll bearing friction due to the drive axle weight of the vehicle.

(b) Calibration shall consist of coasting down the dynamometer for each inertia load combination used. Coastdown times for the interval from 70 to 60 km/h shall be within the tolerances specified in § 86.529. The dynamometer adjustments necessary to produce these results shall be noted for future reference.

(c) The performance check consists of conducting a dynamometer coastdown at one or more inertia-horsepower settings and comparing the coastdown time to the table in Figure F78-9 of § 86.529-78. If the coastdown time is outside the tolerance, a new calibration is required.

§ 86.519-78 Constant volume sampler calibration.

The CVS (Constant Volume Sampler) is calibrated using an accurate flowmeter and restrictor valve. Measurements of various parameters are made and related to flow through the unit. Procedures used by EPA for both PDP (Positive Displacement Pump) and CFV (Critical Flow Venturi) are outlined below. Other procedures yielding equivalent results may be used if approved in advance by the Administrator. After the calibration curve has been obtained, verification of the entire system can be performed by injecting a known mass of gas into the system and comparing the mass indicated by the system to the true mass injected. An indicated error does not necessarily mean that the calibration is wrong, since other factors can influence the accuracy of the system, e.g. analyzer calibration. A verification procedure is found in paragraph (c) of this section.

(a) *PDP calibration.* (1) The following calibration procedure outlines the equipment, the test configuration, and the various parameters which must be measured to establish the flow rate of the constant volume sampler pump. All the parameters related to the pump are simultaneously measured with the parameters related to a flowmeter which is connected in series with the pump. The calculated flow rate (at pump inlet absolute pressure and temperature) can then be plotted versus a correlation function which is the value of a specific combination of pump parameters. The linear equation which relates the pump flow and the correlation function is then determined. In the event that a CVS has a multiple speed drive, a calibration for each range used must be performed.

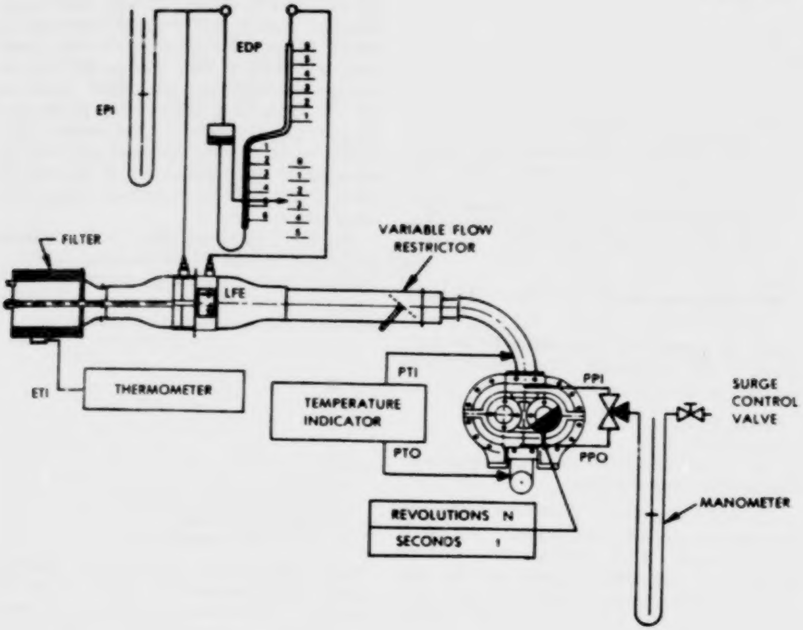
(2) This calibration procedure is based on the measurement of the absolute values of the pump and flowmeter parameters that relate the flow rate at each point. Three conditions must be maintained to assure the accuracy and integrity of the calibration curve. First, the pump pressures should be measured at taps on the pump rather than at the external piping on the pump inlet and outlet. Pressure taps that are mounted at the top center and bottom center of the pump drive headplate are exposed to the actual pump cavity pressures, and therefore reflect the absolute pressure differentials. Secondly, temperature stability must be maintained during the calibration. The laminar flowmeter is sensitive to inlet temperature oscillations which cause the data points to be scattered. Gradual changes (±1° C (1.8° F)) in temperature are acceptable as long as they occur over a period of several minutes. Finally, all connections between the flowmeter and the CVS pump must be absolutely void of any leakage.

(3) During an exhaust emission test the measurement of these same pump parameters enables the user to calculate the flow rate from the calibration equation.

(4) Connect a system as shown in Figure F78-5. Although particular types of equipment are shown, other configurations that yield equivalent results may be used if approved in advance by the Administrator. For the system indicated, the following data with given accuracy are required:

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Tolerances
Barometric pressure (corrected)	P_B	kPa (in. Hg)	±0.03 kPa (±0.01 in. Hg)
Ambient temperature	T_A	° C (° F)	±0.3° C (±0.54° F)
Air temperature into LFE	ETI	° C (F)	±0.15° C (±0.27° F)
Pressure depression upstream of LFE	EPI	kPa (in. H_2O)	±0.01 kPa (±0.05 in. H_2O
Pressure drop across the LFE matrix	EDP	kPa (in. H_2O)	±0.001 kPa (±0.005 in. H_2O
Air temperature at CVS pump inlet	PTI	° C (° F)	±0.25° C (±0.45° F)
Pressure depression at CVS pump inlet	PPI	kPa (in. Fluid)	±0.021 kPa (±0.046 in. Flu
Specific gravity of manometer fluid (1.75 oil)	Sp. Gr.		
Pressure head at CVS pump outlet	PPO	kPa (in. Fluid)	±0.021 kPa (±0.046 in. Flu
Air temperature at CVS pump outlet (optional)	PTO	° C (° F)	±0.25° C (±0.45° F)
Pump revolutions during test period	N	Revs	±1 Rev.
Elapsed time for test period	t	s	±0.05 s.



F78-5 -- PDP-CVS CALIBRATION CONFIGURATION

(5) After the system has been connected as shown in Figure F78-5, set the variable restrictor in the wide open position and run the CVS pump for twenty minutes. Record the calibration data.

(6) Reset the restrictor valve to a more restricted condition in an increment of pump inlet depression (about 1.0 kPa (4" H_2O)) that will yield a minimum of six data points for the total calibration. Allow the system to stabilize for 3 minutes and repeat the data acquisition.

(7) *Data analysis:* (i) The air flow rate, Q_s, at each test point is calculated from the flowmeter data using the manufacturer's prescribed method.

(ii) The air flow rate is then converted to pump flow, V_o, per revolution at absolute pump inlet temperature and pressure.

$$V_o = (Q_s/n) \times (T_p/293.15) \times (101.325/P_p)$$

where:

V_o = Pump flow, m^3/revolution (ft^3/revolution) at T_p, P_p

Q_s = Meter air flow rate in standard cubic metres per minute, standard conditions are 20° C, 101.325 kPa (68° F, 29.92 in. Hg).

n = Pump speed in revolutions per minute.

T_p = Pump inlet temperature, K(R) = PTI + 273.15 for English units, T_p = PTI + 459.67

P_p = Absolute pump inlet pressure, kPa (in. Hg) = P_B·PPI for English units, P_p = P_B·PPI (SP. GR./13.57)

where:

P_B = barometric pressure, kPa (in. Hg)

PPI = Pump inlet depression, kPa (in. fluid)

SP. GR. = Specific gravity of manometer fluid relative to water.

(iii) The correlation function at each test point is then calculated from the calibration data:

Insertillus.545A

where:

X_o = correlation function.

P_p = The pressure differential from pump inlet to pump outlet, kPa (in. Hg) = P_e'P_p

P_e = Absolute pump outlet pressure, kPa (in. Hg) = P_B + PPO for English units, $P_e = P_B$ + PPO(SP. GR./13.57)

where:

PPO = Pressure head at pump outlet, kPa (in. fluid)

(iv) A linear least squares fit is performed to generate the calibration equations which have the forms:

$V_o = D_o$'$M(X_o)$

$n = A$'$B(P_p)$

D_o, M, A, and B are the slope-intercept constants describing the lines.

(8) A CVS system that has multiple speeds shall be calibrated on each speed used. The calibration curves generated for the ranges will be approximately parallel and the intercept values, D_Q, will increase as the pump flow range decreases.

(9) If the calibration has been performed carefully, the calculated values from the equation will be within ±0.50 percent of the measured value of V_O. Values of M will vary from one pump to another, but values of D_O for pumps of the same make, model, and range should agree within ±3 percent of each other. Particulate influx from use will cause the pump slip to decrease as reflected by lower values for *M*. Calibrations should be performed at pump startup and after major maintenance to assure the stability of the pump slip rate. Analysis of mass injection data will also reflect pump slip stability.

(b) *CFV calibration*. (1) Calibration of the Critical Flow Venturi (CFV) is based upon the flow equation for a critical venturi. Gas flow is a function of inlet pressure and temperature:

$$Q_s = \frac{K_r P}{\sqrt{T}}$$

where:

Q_s = Flow

K_r = Calibration coefficient

P = Absolute pressure

T = Absolute temperature

The calibration procedure described below establishes the value of the calibration coefficient at measured values of pressure, temperature and air flow.

(2) The manufacturer's recommended procedure shall be followed for calibrating electronic portions of the CFV.

(3) Measurements necessary for flow calibration are as follows:

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Tolerances
Barometric pressure (corrected)	P_B	kPa (in. Hg)	±0.03 kPa (±0.01 in. Hg)
Air temperature, flowmeter	ETI	°C (°F)	±0.15° C (±0.27° F).
Pressure depression upstream of LFE	EPI	kPa (in. H_2O)	±0.01 kPa (±0.05 in. H_2O).
Pressure drop across LFE matrix	EDP	kPa (in. H_2O)	±0.001 kPa (±0.005 in. H_2O
Air flow	Q_s	m^3/min. (ft^3/min)	±0.5%.
CFV inlet depression	PPI	kPa (in. fluid)	±0.02 kPa (±0.05 in. fluid).
Temperature at venturi inlet	T_v	°C (°F)	±0.25° C (±0.45° F).
Specific gravity of manometer fluid (1.75 oil)	Sp. Gr.		

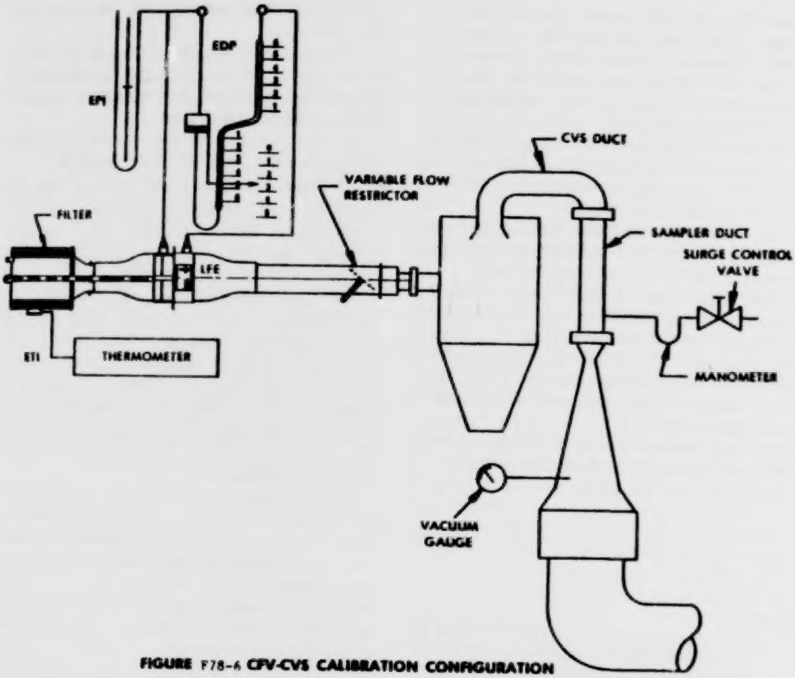

EDP
EPI
FILTER
LFE
ETI
THERMOMETER
VARIABLE FLOW RESTRICTOR
CVS DUCT
SAMPLER DUCT
SURGE CONTROL VALVE
MANOMETER
VACUUM GAUGE

FIGURE F78-6 CFV-CVS CALIBRATION CONFIGURATION

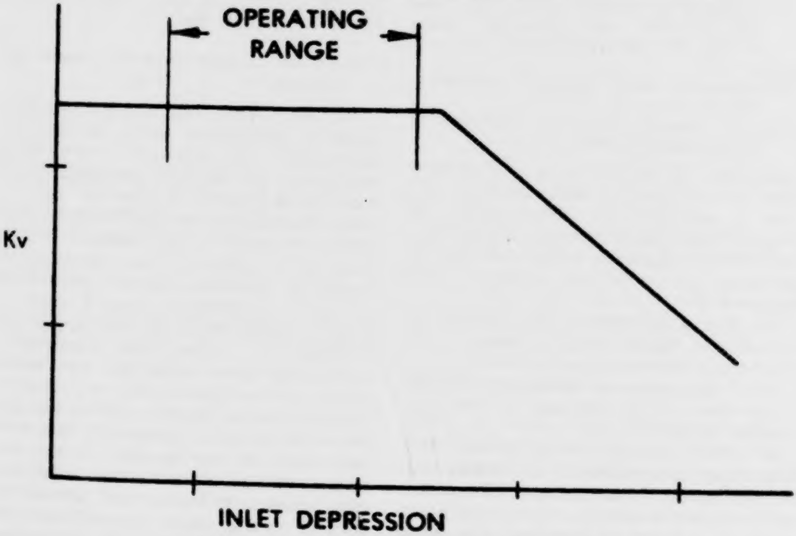


FIGURE F78-7 —SONIC FLOW CHOKING

(4) Set up equipment as shown in Figure F78-6 and check for leaks. Any leaks between the flow measuring device and the critical flow venturi will seriously affect the accuracy of the calibration.

(5) Set the variable flow restrictor to the open position, start the blower and allow the system to stabilize. Record data from all instruments.

(6) Vary the flow restrictor and make at least 8 readings across the critical flow range of the venturi.

(7) *Data analysis.* The data recorded during the calibration are to be used in the following calculations:

(i) The air flow rate, Q_s, at each test point is calculated from the flow meter data using the manufacturer's prescribed method.

(ii) Calculate values of the calibration coefficient for each test point:

$$K_v = \frac{Q_s \sqrt{T_v}}{P_v'}$$

where:

Q_s = Flow rate, standard conditions are 20° C, 101.325 kPa (68° F, 29.92 in. Hg)

T_v = Temperature at venturi inlet, K(R).

P_v = Pressure at venturi inlet, kPa (mm Hg) = $P_B - PPI$ for English units $P_v = P_B -$ PPI (SP. GR./13.57).

where:

PPI = Venturi inlet pressure depression, kPa (in. fluid).

SP. GR. = Specific gravity of manometer fluid, relative to water.

(iii) Plot K_v as a function of venturi inlet depression. For sonic flow, K_v will have a relatively constant value. As pressure decreases (vacuum increases), the venturi becomes unchoked and K_v decreases (is no longer constant). See Figure F78-7.

(iv) For a minimum of 8 points in the critical region calculate an average K_v and the standard deviation.

(v) If the standard deviation exceeds 0.3 percent of the average K_v take corrective action.

(c) *CVS System Verification.* The following "gravimetric" technique can be used to verify that the CVS and analytical instruments can accurately measure a mass of gas that has been injected into the system. (Verification can also be accomplished by constant flow metering using critical flow orifice devices.)

(1) Obtain a small cylinder that has been charged with pure propane or carbon monoxide gas (caution—carbon monoxide is poisonous).

(2) Determine a reference cylinder weight to the nearest 0.01 grams.

(3) Operate the CVS in the normal manner and release a quantity of pure propane or carbon monoxide into the system during the sampling period (approximately 5 minutes).

(4) The calculations of § 86.544 are performed in the normal way except in the case of propane. The density of propane (0.6109 kg/m^3/carbon atom (17.30 g/ft^3/carbon atom)) is used in place of the density of exhaust hydrocarbons. In the case of carbon monoxide, the density of 1.164 kg/m^3 (32.97 g/ft^3) is used.

(5) The gravimetric mass is subtracted from the CVS measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

(6) The cause for any discrepancy greater than ±2 percent must be found and corrected.

[42 FR 1137, Jan. 5, 1977, as amended at 42 FR 56738, Oct. 28, 1977]

§ 86.519-90 Constant volume sampler calibration.

(a) The CVS (Constant Volume Sampler) is calibrated using an accurate flowmeter and restrictor valve. Measurements of various parameters are made and related to flow through the unit. Procedures used by EPA for both PDP (Positive Displacement Pump) and CFV (Critical Flow Venturi) are outlined below. Other procedures yielding equivalent results may be used if approved in advance by the Administrator. After the calibration curve has been obtained, verification of the entire system can be performed by injecting a known mass of gas into the system and comparing the mass indicated by the system to the true mass injected. An indicated error does not necessarily mean that the calibration is wrong, since other factors can influence the accuracy of the system, e.g., analyzer calibration. A verifica tion procedure is found in paragraph (d) of this section.

(b) *PDP calibration.* (1) The following calibration procedures outlines the equipment, the test configuration, and the various parameters which must be measured to establish the flow rate of the constant volume sampler pump. All the parameters related to the pump are simultaneously measured with the parameters related to a flowmeter which is connected in series with the pump. The calculated flow rate (at pump inlet absolute pressure and temperature) can then be plotted versus a correlation function which is the value of a specific combination of pump parameters. The linear equation which relates the pump flow and the correlation function is then determined. In the event that a CVS has a multiple speed drive, a calibration for each range must be performed.

(2) This calibration procedure is based on the measurement of the absolute values of the pump and flowmeter parameters that relate the flow rate at each point. Three conditions must be maintained to assure the accuracy and integrity of the calibration curve. First, the pump pressures should be measured at taps on the pump rather than at the external piping on the pump inlet and outlet. Pressure taps that are mounted at the top center and bottom center of the pump drive headplate are exposed to the actual pump cavity pressures, and therefore reflect the absolute pressure differentials. Secondly, temperature stability must be maintained during the calibration. The laminar flowmeter is sensitive to inlet temperature oscillations which cause the data points to be scattered. Gradual changes (±1°C (±1.8°F)) in temperature are acceptable as long as they occur over a period of several minutes. Finally, all connections between the flowmeter and the CVS pump must be absolutely void of any leakage.

(3) During an exhaust emission test the measurement of these same pump parameters enables the user to calculate the flow rate from the calibration equation.

(4) Connect a system as shown in Figure F78–5. Although particular types of equipment are shown, other configurations that yield equivalent results may be used if approved in advance by the Administrator. For the system indicated, the following data with given accuracy are required:

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Tolerances
Barometric pressure corrected	P_B	kPa (in. Hg)	±0.03 kPa (±0.01 in. Hg)
Ambient temperature	T_A	°C (°F)	±0.3°C (±0.54°F)
Air Temperature into LFE	ETI	°C (°F)	±0.15°C (±0.27°F)
Pressure depression upstream of LFE	EPI	kPa (in. H_2O)	±0.01 kPa (±0.05 in. H_2O)
Pressure drop across the LFE matrix	EDP	kPa (in. H_2O)	±0.001 kPa (±0.005 in. H_2O)
Air temperature at CVS pump inlet	PTI	°C (°F)	±0.25°C (±0.45°F)
Pressure depression at CVS pump inlet	PPI	kPa (in. Fluid)	±0.021 kPa (±0.046 in. Fluid)
Specific gravity of manometer fluid (1.75 oil)	Sp Gr		
Pressure head at CVS pump outlet	PPO	kPa (in. Fluid)	±0.21 kPa (±0.046 in. Fluid)
Air temperature at CVS pump outlet (optional)	PTO	°C (°F)	±0.25°C (±0.45°F)
Pump revolutions during test period	N	Revs	± 1 Rev.
Elapsed time for test period	t	sec.	±0.05 sec.

(5) After the system has been connected as shown in Figure F78–6, set the variable restrictor in the wide open position and run the CVS pump for twenty minutes. Record the calibration data.

(6) Reset the restrictor valve to a more restricted condition in an increment of pump inlet depression (about 1.0 kPa (4 in. H_2O)) that will yield a minimum of six data points for the total calibration. Allow the system to stabilize for 3 minutes and repeat the data acquisition.

(7) Data analysis:

(i) The air flow rate, Q_s, at each test point is calculated from the flowmeter data using the manufacturers' prescribed method.

(ii) The air flow rate is then converted to pump flow, V_o in m³ per revolution at absolute pump inlet temperature and pressure.

$$V_o = (Q_s/n)\times(T_p/293) \times (101.3/P_p)$$

Where:

(A) V_o = Pump flow, m³/rev (ft³/rev) at T_p, P_p.

(B) Q_s = Meter air flow rate in standard cubic meters per minute; standard conditions are 20°C, 101.3 kPa (68°F, 29.92 in. Hg).

(C) n=Pump speed in revolutions per minute.

(D)(*1*) T_p=Pump inlet temperature, (°K)=PTI+273.

(*2*) *For English units,* T_p=PTI+460.

(E)(*1*) P_p=Absolute pump inlet pressure, kPa (in. Hg)=P_B−PPI.

(*2*) *For English units,* $P_p=P_B$−PPI(SP.GR./13.57).

Where:

(F) P_B=barometric pressure, kPa (in. Hg.).

(G) PPI=Pump inlet depression, kPa (in. fluid).

(H) SP.GR.=Specific gravity of manometer fluid relative to water.

(iii) The correlation function at each test point is then calculated from the calibration data:

$$X_o = \frac{1}{n}\sqrt{\frac{\Delta P_p}{P_e}}$$

Where:

(A) X_o=correlation function.

(B) ΔP_p=The pressure differential from pump inlet to pump outlet, kPa (in. Hg)=P_e-P_p.

(C)(*1*) P_e=Absolute pump outlet pressure, kPa (in. Hg)=P_B+PPO.

(*2*) *For English units,* $P_e=P_B$+PPO(SP.GR./13.57).

Where:

(D) PPO=Pressure head at pump outlet, kPa (in. fluid).

(iv) A linear least squares fit is performed to generate the calibration equations which have the forms:

$V_o=D_o-M(X_o)$

$n=A-B(\Delta P_p)$

D_o, M, A, and B are the slope-intercept constants, describing the lines.

(8) A CVS system that has multiple speeds shall be calibrated on each speed used. The calibration curves generated for the ranges will be approximately parallel and the intercept values, D_o, will increase as the pump flow range decreases.

(9) If the calibration has been performed carefully, the calculated values from the equation will be within ±0.50 percent of the measured value of V_o. Values of M will vary from one pump to another, but values of D_o for pumps of the same make, model, and range should agree within ±3 percent of each other. Particulate influx from use will cause the pump slip to decrease as reflected by lower values for M. Calibrations should be performed at pump startup and after major maintenance to assure the stability of the pump slip rate. Analysis of mass injection data will also reflect pump slip stability.

(c) *CFV calibration.* (1) Calibration of the Critical Flow Venturi (CFV) is based upon the flow equation for a critical venturi. Gas flow is a function of inlet pressure and temperature:

$$Q_s = \frac{K_v P}{\sqrt{T}}$$

Where:

(i) Q_s=Flow.

(ii) K_v=Calibration coefficient.

(iii) P=Absolute pressure.

(iv) T=Absolute temperature.

The calibration procedure described below establishes the value of the calibration coefficient at the measured values of pressure, temperature and air flow.

(2) The manufacturer's recommended procedure shall be followed for calibrating electronic portions of the CFV.

(3) Measurements necessary for flow calibration are as follows:

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Tolerances
Barometric pressure (corrected)	P_B	kPa (in. Hg)	±0.03 kPa (±0.01 in. Hg)
Air temperature, flowmeter	ETI	°C (°F)	±0.15° C (±0.27° F)
Pressure depression upstream of LFE	EPI	kPa (in. H_2O)	±0.01kPa (±0.05 in. H_2O)
Pressure drop across LFE matrix	EDP	kPa (in. H_2O)	±0.001 kPa (±0.005 in. H_2O)
Air flow	Q_s	m^3/min (ft^3/min)	±0.5%
CFV inlet depression	PPI	kPa (in. fluid)	±0.02 kPa (±0.05 in. fluid)
Temperature at venturi inlet	T_v	°C (°F)	±0.25 °C (±0.45°F)
Specific gravity of manometer fluid (1.75 oil)	Sp Gr	. .	. . .

(4) Set up equipment as shown in Figure F78-6 and check for leaks. Any leaks between the flow measuring device and the critical flow venturi will seriously affect the accuracy of the calibration.

(5) Set the variable flow restrictor to the open position, start the blower and allow the system to stabilize. Record data from all instruments.

(6) Vary the flow restrictor and make at least 8 readings across the critical flow range of the venturi.

(7) *Data analysis.* The data recorded during the calibration are to be used in the following calculations:

(i) The air flow rate, Q_s, at each test point is calculated from the flowmeter data using the manufacturer's prescribed method.

(ii) Calculate values of the calibration coefficient for each test point:

$$K_v = \frac{Q_s\sqrt{T_v}}{P_v}$$

Where:

(A) Q_s=Flow rate in m^3/minute, standard conditions are 20 °C, 101.3 kPa (68 °F, 29.92 in. Hg)

(B) T_v=Temperature at venturi inlet, °K(°R).

(C)(*1*) P_v=Pressure at venturi inlet, kPa (mm Hg)=P_B-PPI.

(*2*) *For English units,* $P_v = P_B - PPI$ (SP.GR./13.57).

Where:

(D) PPI=Venturi inlet pressure depression, kPa (in. fluid).

(E) SP.GR.=Specific gravity of manometer fluid, relative to water.

(iii) Plot K_v as a function of venturi inlet depression. For sonic flow, K_v will have a relatively constant value. As pressure decreases (vacuum increases), the venturi becomes unchoked and K_v decreases (is no longer constant). See Figure F78-7.

(iv) For a minimum of 8 points in the critical region, calculate an average K_v and the standard deviation.

(v) If the standard deviation exceeds 0.3 percent of the average K_v, take corrective action.

(d) *CVS system verification.* The following "gravimetric" technique can be used to verify that the CVS and analytical instruments can accurately measure a mass of gas that has been injected into the system. If the CVS and analytical system will be used only in the testing of gasoline-fueled vehicles, the system verification may be performed using either propane or carbon monoxide. If the CVS and analytical system will be used with methanol-fueled vehicles as well as gasoline-fueled vehicles, system verification performance check must include a methanol check in addition to either the propane or carbon monoxide check. (Verification can also be accomplished by constant flow metering using critical flow orifice devices.)

(1) Obtain a small cylinder that has been charged with pure propane or carbon monoxide gas (caution--carbon monoxide is poisonous). Obtain another small cylinder which has been charged with pure methanol if the system will be used for methanol-fueled vehicle testing. Since this cylinder will be heated to 150–155 °F, care must be taken to ensure that the liquid volume of methanol placed in the cylinder does not exceed approximately one-half of the total volume of the cylinder.

(2) Determine a reference cylinder weight to the nearest 0.01 grams.

(3) Operate the CVS in the normal manner and release a quantity of pure propane or carbon monoxide into the system during the sampling period (approximately 5 minutes).

(4) Following the completion of paragraph (d)(3) of this section, continue to operate the CVS in the normal manner and release a quantity of pure methanol into the system during the sampling period (approximately 5 minutes).

(5) The calculations of § 86.544 are performed in the normal way except in the case of propane. The density of propane (0.6109 kg/m³/carbon atom (17.30 g/ft³/carbon atom)) is used in place of the density of exhaust hydrocarbons. In the case of carbon monoxide, the density of 1.164 kg/m³ (32.97 g/ft³) is used. In the case of methanol, the density of 1.332 kg/m³ (37.71 g/ft³) is used.

(6) The gravimetric mass is subtracted from the CVS measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

(7) The cause for any discrepancy greater than ±2 percent must be found and corrected.

[54 FR 14546, Apr. 11, 1989]

§ 86.521-78 Hydrocarbon analyzer calibration.

(a) *Initial and periodic optimization of detector response.* Prior to its introduction into service and at least annually thereafter the FID hydrocarbon analyzer shall be adjusted for optimum hydrocarbon response. Alternate methods yielding equivalent results may be used if approved in advance by the Administrator.

(1) Follow the manufacturer's instructions for instrument startup and basic operating adjustment using the appropriate fuel and zero grade air.

(2) Optimize on the most common operating range. Introduce into the analyzer, a propane in air mixture with a propane concentration equal to approximately 90% of the most common operating range.

(3) Select an operating fuel flow rate that will give near maximum response and least variation in response with minor fuel flow variations.

(4) To determine the optimum air flow, use the fuel flow setting determined above and vary air flow.

(5) After the optimum flow rates have been determined, they are recorded for future reference.

(b) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter the FID hydrocarbon analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate as when analyzing samples.

(1) Adjust analyzer to optimize performance.

(2) Zero the hydrocarbon analyzer with zero grade air.

(3) Calibrate on each normally used operating range with propane in air calibration gases having nominal concentrations of 50 and 100 percent of that range. Additional calibration points may be generated.

§ 86.521-90 Hydrocarbon analyzer calibration.

(a) The FID hydrocarbon analyzer shall receive the following initial and periodic calibration. The HFID used with methanol-fueled vehicles shall be operated at 235°F±15 °F (113°C±8 °C)

(b) *Initial and periodic optimization of detector response.* Prior to its introduction into service and at least annually thereafter, the FID hydrocarbon analyzer shall be adjusted for optimum hydrocarbon response. Alternate methods yielding equivalent results may be used, if approved in advance by the Administrator.

(1) Follow the manufacturer's instructions or good engineering practice for instrument startup and basic operating adjustment using the appropriate FID fuel and zero-grade air.

(2) Optimize on the most common operating range. Introduce into the analyzer a propane in air mixture (methanol in air mixture for methanol-fueled vehicles when optional methanol calibrated FID procedure is used during the 1990 through 1994 model years) with a propane (or methanol) concentration equal to approximately 90 percent of the most common operating range.

(3) Select an operating FID fuel flow rate that will give near maximum re-

sponse and least variation in response with minor fuel flow variations.

(4) To determine the optimum air flow, use the FID fuel flow setting determined above and vary air flow.

(5) After the optimum flow rates have been determined, record them for future reference.

(c) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter the FID hydrocarbon analyzer shall be calibrated on all normally used instrument ranges, and, if applicable, the methanol response factor shall be determined (paragraph (d) of this section). Use the same flow rate as when analyzing sample.

(1) Adjust analyzer to optimize performance.

(2) Zero the hydrocarbon analyzer with zero grade air.

(3) Calibrate on each normally used operating range with propane in air calibration gases (methanol in air as appropriate) having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. For each range calibrated, if the deviation from a least squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

(d) *FID response factor to methanol.* When the FID analyzer is to be used for the analysis of hydrocarbon samples containing methanol, the methanol response factor of the analyzer shall be established. The methanol response factor shall be determined at several concentrations in the range of concentrations in the exhaust sample.

(1) The bag sample of methanol for analysis in the FID shall be prepared using the apparatus shown in Figure F90-4. A known volume of methanol is injected, using a microliter syringe, into the heated mixing zone (250 °F (121°C)) of the apparatus. The methanol is vaporized and swept into the sample bag with a known volume of zero grade air measured by a dry gas meter.

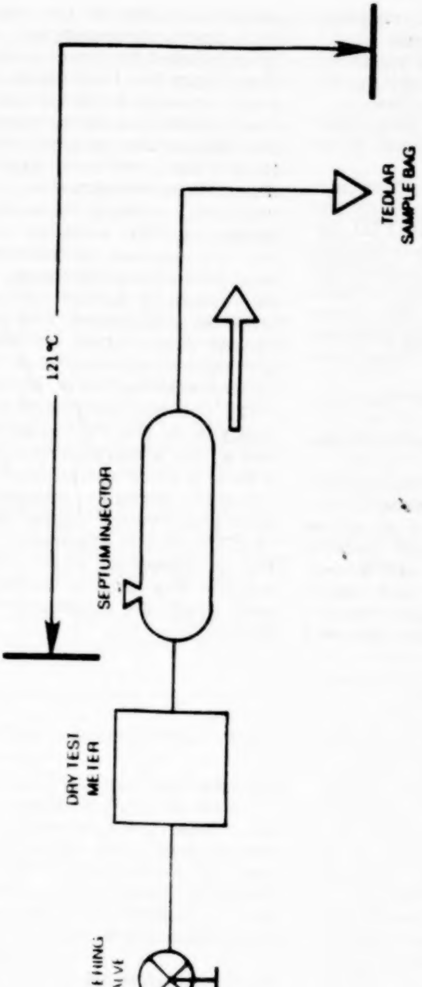

PUMP
ZERO GRADE AIR
METERING VALVE
DRY TEST METER
SEPTUM INJECTOR
121°C
TEDLAR SAMPLE BAG

FIGURE F90-4 APPARATUS FOR PREPARATION OF FID METHANOL RESPONSE CALIBRATION MIX

(2) The bag sample is analyzed using the FID.

(3) The FID response factor, r, is calculated as follows:

$r = FID_{ppm}/SAM_{ppm}$

Where:

(i) r = FID response factor.

(ii) FID_{ppm} = FID reading, ppmC.

(iii) SAM_{ppm} = methanol concentration in the sample bag, ppmC.

$$= \frac{0.02406 \times \text{Fuel injected} \times \text{Fuel density}}{\text{Air volume} \times \text{Mol. Wt. } CH_3}$$

Where:

(iv) 0.02406 = Volume of one mole at 101.3 kPa (29.92 in. Hg) and 20 °C (68 °F), m^3.

(v) Fuel injected = Volume of methanol injected, ml.

(vi) Fuel Density = Density of methanol, 0.7914 g/ml

(vii) Air volume = Volume of zero grade air, m^3

(viii) Mol. Wt. CH_3OH = 32.04

[54 FR 14546, Apr. 11, 1989]

§ 86.522–78 Carbon monoxide analyzer calibration.

(a) *Initial and periodic interference check.* Prior to its introduction into service and annually thereafter the NDIR carbon monoxide analyzer shall be checked for response to water vapor and CO_2:

(1) Follow the manufacturer's instructions for instrument startup and operation. Adjust the analyzer to optimize performance on the most sensitive range.

(2) Zero the carbon monoxide analyzer with either zero grade air or zero grade nitrogen.

(3) Bubble a mixture of 3 percent CO_2 in N_2 through water at room temperature and record analyzer response.

(4) An analyzer response of more than 1 percent of full scale for ranges above 300 ppm full scale or of more than 3 ppm on ranges below 300 ppm full scale will require corrective action. (Use of conditioning columns is one form of corrective action which may be taken.)

(b) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter the NDIR carbon monoxide analyzer shall be calibrated.

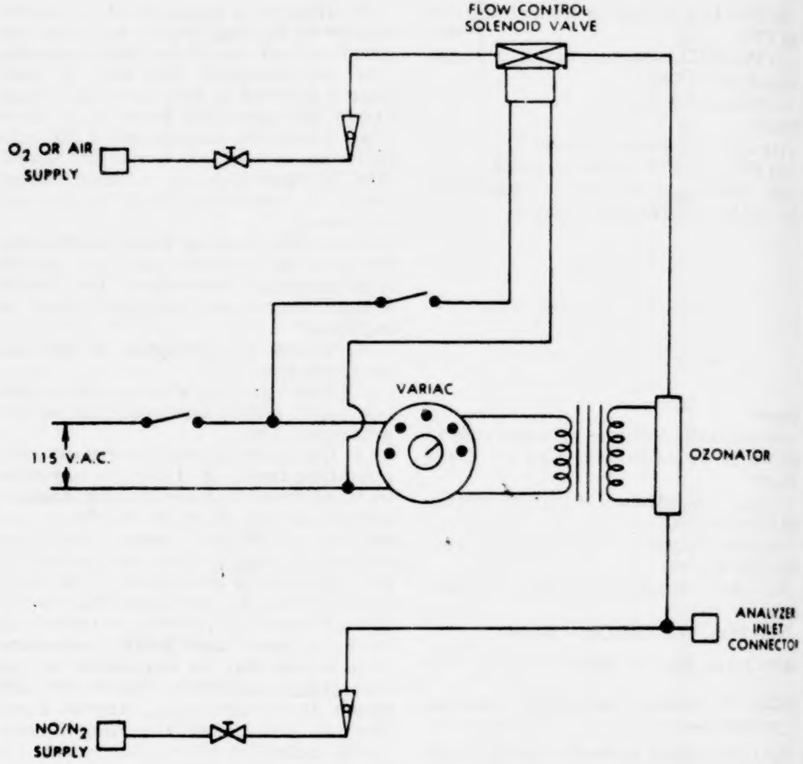
(1) Adjust the analyzer to optimize performance.

(2) Zero the carbon monoxide analyzer with either zero grade air or zero grade nitrogen.

(3) Calibrate on each normally used operating range with carbon monoxide in N_2 calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. Additional calibration points may be generated. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit nonlinear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

§ 86.523–78 Oxides of nitrogen analyzer calibration.

(a) Prior to its introduction into service and weekly thereafter, if oxides of nitrogen are measured, the chemiluminescent oxides of nitrogen analyzer shall be checked for NO_2 to NO converter efficiency. Figure F78-8 is a reference for the following steps:



(SEE FIG F78-3 FOR SYMBOL LEGEND)
FIGURE F78-8—NO_x CONVERTER EFFICIENCY DETECTOR

(1) Follow the manufacturer's instructions for instrument startup and operation. Adjust the analyzer to optimize performance.

(2) Zero the oxides of nitrogen analyzer with zero grade air or zero grade nitrogen.

(3) Connect the outlet of the NO_x generator to the sample inlet of the oxides of nitrogen analyzer which has been set to the most common operating range.

(4) Introduce into the NO_x generator analyzer-system a NO in nitrogen (N_2) mixture with a NO concentration equal to approximately 80 percent of the most common operating range. The NO_2 content of the gas mixture shall be less than 5 percent of the NO concentration.

(5) With the oxides of nitrogen analyzer in the NO mode, record the concentration of NO indicated by the analyzer.

(6) Turn on the NO_x generator O_2 (or air) supply and adjust the O_2 (or air) flow rate so that the NO indicated by the analyzer is about 10 percent less than indicated in step 5. Record the concentration of NO in this NO+O_2 mixture.

(7) Switch the NO_x generator to the generation mode and adjust the generation rate so that the NO measured on the analyzer is 20 percent of that measured in step 5. There must be at least 10 percent unreacted NO at this point. Record the concentration of residual NO.

(8) Switch the oxides of nitrogen analyzer to the NO_x mode and measure total NO_x. Record this value.

(9) Switch off the NO_x generation but maintain gas flow through the system. The oxides of nitrogen analyzer will indicate the NO_x in the $NO+O_2$ mixture. Record this value.

(10) Turn off the NO_x generator O_2 (or air) supply. The analyzer will now indicate the NO_x in the original NO in N_2 mixture. This value should be no more than 5 percent above the value indicated in step 4.

(11) Calculate the efficiency of the NOx converter by substituting the concentrations obtained into the following equation:

$$\text{Percent Efficiency} = [1 + (a-b)/(c-d)] \times 100$$

where:

a=concentration obtained in step (8).
b=concentration obtained in step (9).
c=concentration obtained in step (6).
d=concentration obtained in step (7).

If converter efficiency is not greater than 90 percent corrective action will be required.

(b) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter, if oxides of nitrogen are measured, the chemiluminescent oxides of nitrogen analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate as when analyzing samples. Proceed as follows:

(1) Adjust analyzer to optimize performance.

(2) Zero the oxides of nitrogen analyzer with zero grade air or zero grade nitrogen.

(3) Calibrate on each normally used operating range with NO in N_2 calibration gases with nominal concentrations of 50 and 100 percent of that range. Additional calibration points may be generated.

[42 FR 1137, Jan. 5, 1977, as amended at 52 FR 47870, Dec. 16, 1987]

§ 86.524-78 Carbon dioxide analyzer calibration.

(a) Prior to its introduction into service and monthly thereafter the NDIR carbon dioxide analyzer shall be calibrated:

(1) Follow the manufacturer's instructions for instrument startup and operation. Adjust the analyzer to optimize performance.

(2) Zero the carbon dioxide analyzer with either zero grade air or zero grade nitrogen.

(3) Calibrate on each normally used operating range with carbon dioxide in N_2 calibration gases with nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. Additional calibration points may be generated. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

§ 86.526-78 Calibration of other equipment.

(a) Other test equipment used for testing shall be calibrated as often as required by the manufacturer or as necessary according to good practice.

§ 86.526-90 Calibration of other equipment.

Other test equipment used for testing shall be calibrated as often as required by the manufacturer or as necessary according to good practice. Specific equipment requiring calibration is the gas chromatograph and flame ionization detector used in measuring methanol and the high pressure liquid chromatograph (HPLC) and ultraviolet detector for measuring formaldehyde.

[54 FR 14551, Apr. 11, 1989]

§ 86.527-78 Test procedures, overview.

The procedures described in this and subsequent sections are used to determine the conformity of vehicles with the standards set forth in Subpart E.

(a) The overall test consists of prescribed sequences of fueling, parking, and operating conditions.

(b) The exhaust emission test is designed to determine hydrocarbon, carbon monoxide, and oxides of nitrogen mass emissions while simulating an average trip in an urban area. The test consists of engine startups and vehicle operation on a chassis dynamometer, through a specified driving schedule. A proportional part of the diluted exhaust emissions is collected continuously for subsequent analysis, using a constant volume (variable dilution) sampler.

(c) [Reserved]

(d) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with Subpart E.

§ 86.527-90 Test procedures, overview.

(a) The procedures described in this and subsequent sections are used to determine the conformity of vehicles with the standards set forth in Subpart E.

(b) The overall test consists of prescribed sequences of fueling, parking, and operating conditions.

(c) The exhaust emission test is designed to determine hydrocarbon (gasoline-fueled vehicles), methanol, formaldehyde, and hydrocarbon (methanol-fueled vehicles), carbon monoxide, and oxides of nitrogen mass emissions while simulating an average trip in an urban area. The test consists of engine startups and vehicle operation on a chassis dynamometer, through a specified driving schedule. A proportional part of the diluted exhaust emissions is collected continuously for subsequent analysis, using a constant volume (variable dilution) sampler.

(d) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this Subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with Subpart E.

[54 FR 14551, Apr. 11, 1989]

§ 86.528-78 Transmissions.

(a) Vehicles equipped with transfer cases, multiple sprockets, etc., shall be tested in the manufacturer's recommended configuration for street or highway use. If more than one configuration is recommended or if the recommendation is deemed unreasonable by the Administrator, the Administrator will specify the test configuration.

(b) All tests shall be conducted with automatic transmissions in "Drive" (highest gear). Automatic clutch-torque converter transmissions may be shifted as manual transmissions at the option of the manufacturer.

(c) Idle modes shall be run with automatic transmissions in "Drive" and the wheels braked, manual transmission shall be in gear with the clutch disengaged; except first idle, see §§ 86.536 and 86.537.

(d) The vehicle shall be driven with minimum throttle movement to maintain the desired speed. No simultaneous use of brake and throttle shall be permitted.

(e) Acceleration modes shall be driven smoothly. Automatic transmissions shall shift automatically through the normal sequence of gears; manual transmissions shall be shifted as recommended by the manufacturer to the ultimate purchaser (unless determined to be unreasonable by the Administrator) with the operator closing the throttle during each shift and accomplishing the shift with minimum time. If the vehicle cannot accelerate at the specified rate, the vehicle shall be operated with the throttle fully opened until the vehicle speed reaches the value prescribed for that time in the driving schedule.

(f) The deceleration modes shall be run in gear using brakes or throttle as necessary to maintain the desired speed. Manual transmission vehicles shall be downshifted using the same shift points as when upshifting or as recommended by the manufacturer in the vehicle owner's manual. All downshifts shall be made smoothly, disengaging the clutch while shifting and engaging the clutch once the lower gear has been selected. For those modes which require the vehicle to decelerate to zero, manual transmission clutches shall be disengaged when the speed drops below 15 km/h (9.3 mph) for vehicles with engine displacements equal to or greater than 280 cc (17.1 cu. in.), when the speed drops below 10 km/h (6.2 mph) for vehicles with engine displacements less than 280 cc (17.1 cu. in.), when engine roughness is evident, or when engine stalling is imminent.

(g) If downshifting during deceleration is not permitted in the vehicle owner's manual, manual transmissions will be downshifted at the beginning of or during a power mode if recommended by the manufacturer or if the engine obviously is lugging. For those modes which require these vehicles to decelerate to zero, manual transmission clutches shall be disengaged when the speed drops below 25 km/h (15.5 mph) for vehicles with engine displacement equal to or greater than 280 cc (17.1 cu. in.), when the speed drops below 20 km/h (12.4 mph) for vehicles with engine displacements less than 280 cc (17.1 cu. in.), when engine roughness is evident, or when engine stalling is imminent. While the clutch is disengaged and during these deceleration modes, the vehicle shall be shifted to the appropriate gear for starting the next mode.

(h) If shift speeds are not recommended by the manufacturer, manual transmission vehicles shall be shifted as follows:

(1) For Class I and II motorcycles:

Shift	Speed
1st to 2d gear	19 km/h (11.8 mi/h).
2d to 3d gear	33 km/h (20.5 mi/h).
3d to 4th gear	44 km/h (27.3 mi/h).
4th to 5th gear	53 km/h (32.9 mi/h).

(2) For Class III motorcycles:

Shift	Speed
1st to 2d gear	30 km/h (18.6 mi/h).
2d to 3d gear	45 km/h (28.0 mi/h).
3d to 4th gear	60 km/h (37.3 mi/h).
4th to 5th gear	75 km/h (46.6 mi/h).

(3) Higher gears may be used at the manufacturer's option.

§ 86.529–78 Road load force and inertia weight determination.

(a) Road load as a function of speed is given by the following equation:

$$F = A + CV^2$$

The values for coefficients *A* and *C* and the test inertia are given in Figure F78–9. Velocity (*V*) is in km/h and force (*F*) is in newtons. The forces given by this equation shall be simulated to the best ability of the equipment being used.

(b) The inertia given in Figure F78–9 shall be used. Motorcycles with loaded vehicle mass outside these limits shall be tested at an equivalent inertial mass and road load force specified by the Administrator.

FIGURE F78–9

Loaded vehicle mass (kg)	Equivalent inertial mass (kg)	Force coefficients		Force at 65 km/h (nt)	70 to 60 kn/h coastdown calibration times		
		A (nt)	C (nt/(km/h)²)		Target time (sec)	Allowable tolerance	
						Longest time (sec)	Shortest time (sec)
95–105	100	0.0	0.224	94.8	2.95	3.1	2.8
106–115	110	0.82	.0227	96.8	3.18	3.3	3.0
116–125	120	1.70	.0230	98.8	3.39	3.6	3.2
126–135	130	2.57	.0233	100.9	3.60	3.8	3.4
136–145	140	3.44	.0235	102.9	3.80	4.0	3.6
146–155	150	4.32	0.230	104.9	3.99	4.2	3.8
156–165	160	5.19	.0241	107.0	4.10	4.4	4.0
166–175	170	6.06	.0244	109.0	4.36	4.6	4.2
176–185	180	6.94	.0246	111.0	4.53	4.7	4.3
186–195	190	7.81	.0249	113.1	4.69	4.9	4.5
196–205	200	8.69	.0252	115.1	4.85	5.1	4.6

FIGURE F78-9—Continued

Loaded vehicle mass (kg)	Equivalent inertial mass (kg)	Force coefficients		Force at 65 km/h (nt)	70 to 60 kn/h coastdown calib times		
		A (nt)	C (nt/(km/h)^2)		Target time (sec)	Allowable toleranc	
						Longest time (sec)	Shorte time (se
206-215	210	9.56	.0255	117.1	5.00	5.2	[illegible]
216-225	220	10.43	.0257	119.2	5.15	5.4	[illegible]
226-235	230	11.31	.0260	121.2	5.30	5.5	[illegible]
236-245	240	12.18	.0263	123.2	5.43	5.7	[illegible]
246-255	250	13.06	.0266	125.3	5.57	5.8	[illegible]
256-265	260	13.93	.0268	127.3	5.70	5.9	[illegible]
266-275	270	14.80	.0271	129.3	5.82	6.1	[illegible]
276-285	280	15.68	.0274	131.4	5.95	6.2	[illegible]
286-295	290	16.55	.0277	133.4	6.06	6.3	[illegible]
296-305	300	17.43	.0279	135.4	6.18	6.4	[illegible]
306-315	310	18.39	.0282	137.5	6.29	6.5	[illegible]
316-325	320	19.17	.0285	139.5	6.40	6.6	[illegible]
326-335	330	30.05	.0288	141.6	6.50	6.7	[illegible]
336-345	340	20.92	.0290	143.6	6.60	6.8	[illegible]
346-355	350	21.80	.0293	145.6	6.70	6.9	[illegible]
356-365	360	22.67	.0296	147.7	6.80	7.0	[illegible]
366-375	370	23.54	.0299	149.7	6.89	7.1	[illegible]
376-385	380	24.42	0301	151.7	6.98	7.2	[illegible]
386-395	390	25.29	.0304	153.8	7.07	7.3	[illegible]
396-405	400	26.17	.0307	155.8	7.16	7.4	[illegible]
406-415	410	27.04	.0310	157.8	7.24	7.5	[illegible]
416-425	420	27.91	.0312	159.9	7.33	7.6	[illegible]
426-435	430	28.79	.0315	161.9	7.41	7.6	[illegible]
436-445	440	29.66	.0317	163.7	7.49	7.7	[illegible]
446-455	450	30.54	.0318	164.9	7.61	7.8	[illegible]
456-465	460	31.41	.0319	166.0	7.73	8.0	[illegible]
466-475	470	32.28	.0319	167.1	7.84	8.1	[illegible]
476-485	480	33.16	.0320	168.3	7.95	8.2	[illegible]
486-495	490	43.03	..32.	169.4	8.06	8.3	[illegible]
496-505	500	34.90	.0321	170.5	8.17	8.4	[illegible]
506-515	510	35.78	.0322	171.7	8.28	8.5	[illegible]
516-525	520	36.65	.0322	172.8	8.39	8.6	[illegible]
526-535	530	37.53	.0323	173.9	8.49	8.7	[illegible]
536-545	540	38.40	.0323	175.1	8.60	8.8	[illegible]
546-555	550	39.27	.0324	176.2	8.70	9.0	[illegible]
556-565	560	40.15	.0325	177.3	8.80	9.1	[illegible]
566-575	570	41.02	.0325	178.5	8.90	9.2	[illegible]
576-585	580	41.90	.0326	179.6	9.00	9.3	[illegible]
586-595	590	42.77	.0327	180.8	9.10	9.4	[illegible]
596-605	600	43.64	.0327	181.9	9.19	9.5	[illegible]
606-615	610	44.52	.0328	183.0	9.29	9.5	[illegible]
616-625	620	45.39	.0328	184.2	9.38	9.6	[illegible]
626-635	630	46.27	.0329	185.3	9.47	9.7	[illegible]
636-645	640	47.14	.0330	186.4	9.56	9.8	[illegible]
646-655	650	48.01	.0330	187.6	9.65	9.9	[illegible]
565-665	660	48.89	.0331	188.7	9.74	10.0	[illegible]
666-675	670	49.76	.0332	189.8	9.83	10.1	[illegible]
676-685	680	50.64	.0332	191.0	9.92	10.2	[illegible]
686-695	690	51.91	.0333	192.1	10.01	10.3	[illegible]
696-705	700	52.38	.0333	193.2	10.09	10.4	[illegible]
706-715	710	53.26	.0334	194.4	10.17	10.4	[illegible]
716-725	720	54.13	.0335	195.5	10.26	10.5	[illegible]
726-735	730	55.01	.0335	196.6	10.34	10.6	[illegible]
736-745	740	55.88	.0336	197.8	10.42	10.7	[illegible]
746-755	750	56.75	.0336	198.9	10.50	10.8	[illegible]
756-760	760	57.63	.0337	200.1	10.58	10.9	[illegible]

(c) The dynamometer shall be adjusted to reproduce the specified road load as determined by the most recent calibration. Alternatively, the actual vehicle road load can be measured and duplicated:

(1) Make at least 5 replicate coast-downs in each direction from 70 to 60 km/h on a smooth, level, track under

balanced wind conditions. The driver must have a mass of 80±10 kg and be in the normal driving position. Record the coastdown time.

(2) Average the coastdown times. Adjust the dynamometer load so that the coastdown time is duplicated with the vehicle and driver on the dynamom-eter.

(3) Alternate procedures may be used if approved in advance by the Administrator.

§ 86.530-78 Test sequence, general requirements.

(a) Ambient temperature levels encountered by the test vehicle throughout the test sequence shall not be less than 20° C (68° F) nor more than 30° C (86° F). The vehicle shall be approximately level during the emission test to prevent abnormal fuel distribution.

§ 86.531-78 Vehicle preparation.

(a) The manufacturer shall provide additional fittings and adapters, as required by the Administrator * * *, such as * * * to accommodate a fuel drain at the lowest point possible in the tank(s) as installed on the vehicle and to provide for exhaust sample collection.

§ 86.532-78 Vehicle preconditioning.

(a) The vehicle shall be moved to the test area and the following operations performed:

(1) The fuel tank(s) shall be drained through the provided fuel tank(s) drain(s) and charged with the specified test fuel, § 86.513, to half the tank(s) capacity.

(2) The vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through one Urban Dynamometer Driving Schedule test procedure (see § 86.515 and Appendix I). The vehicle need not be cold, and may be used to set dynamometer horsepower.

(b) Within five (5) minutes of completion of preconditioning, the vehicle shall be removed from the dynamometer and may be driven or pushed to the soak area to be parked. The vehicle shall be stored for not less than the following times prior to the cold start exhaust test.

	Hours
Class I	6
Class II	8
Class III	12

In no case shall the vehicle be stored for more than 36 hours prior to the cold start exhaust test.

§ 86.535-78 Dynamometer procedure.

(a) The dynamometer run consists of two tests, a "cold" start test and a "hot" start test following the "cold" start by 10 minutes. Engine startup (with all accessories turned off), operation over the driving schedule, and engine shutdown make a complete cold start test. Engine startup and operation over the first 505 seconds of the driving schedule complete the hot start test. The exhaust emissions are diluted with ambient air and a continuously proportional sample is collected for analysis during each phase. The composite samples collected in bags are analyzed for hydrocarbons, carbon monoxide, carbon dioxide, and, optionally, for oxides of nitrogen. A parallel sample of the dilution air is similarly analyzed for hydrocarbon, carbon monoxide, carbon dioxide, and, optionally, for oxides of nitrogen.

(b) [Reserved]

(c) The vehicle speed, as measured from the dynamometer roll, shall be used. A speed vs. time recording, as evidence of dynamometer test validity, shall be supplied on request of the Administrator.

(d) Practice runs over the prescribed driving schedule may be performed at test points, provided an emission sample is not taken, for the purpose of finding the minimum throttle action to maintain the proper speed-time relationship, or to permit sampling system adjustments.

(e) The drive wheel tires must be inflated to the manufacturer's recommended pressure, ±15kPa (±2.2 psi). The drive wheel tire pressure shall be reported with the test results.

(f) If the dynamometer has not been operated during the two hour period immediately preceding the test, it shall be warmed up for 15 minutes by operating at 50 km/h (31.1 mph) using a non-test vehicle, or as recommended by the dynamometer manufacturer.

(g) If the dynamometer horsepower must be adjusted manually, it shall be set within one hour prior to the exhaust emissions test phase. The test vehicle shall not be used to make this adjustment. Dynamometers using automatic control of preselectable power settings may be set anytime prior to the beginning of the emissions test.

(h) The driving distance, as measured by counting the number of dynamometer roll revolutions, shall be determined for the transient cold start, stabilized cold start, and transient hot start phases of the test.

[42 FR 1137, Jan. 5, 1977, as amended at 42 FR 56738, Oct. 28, 1977]

§ 86.535-90 Dynamometer procedure.

(a) The dynamometer run consists of two tests, a "cold" start test and a "hot" start test following the "cold" start by 10 minutes. Engine startup (with all accessories turned off), operation over the driving schedule, and engine shutdown make a complete cold start test. Engine startup and operation over the first 505 seconds of the driving schedule complete the hot start test. The exhaust emissions are diluted with ambient air and a continuously proportional sample is collected for analysis during each phase. The composite samples collected in bags are analyzed for hydrocarbons, carbon monoxide, carbon dioxide, and, optionally, for oxides of nitrogen. A parallel sample of the dilution air is similarly analyzed for hydrocarbon, carbon monoxide, carbon dioxide, and, optionally, for oxides of nitrogen. Methanol and formaldehyde samples (exhaust and dilution air) are collected and analyzed for methanol-fueled vehicles (a single dilution air formaldehyde sample covering the total time of the test may be collected in place of individual test phases).

(b) [Reserved]

(c) The vehicle speed, as measured from the dynamometer roll, shall be used. A speed *vs.* time recording, as evidence of dynamometer test validity, shall be supplied on request of the Administrator.

(d) Practice runs over the prescribed driving schedule may be performed at test points, provided an emission sample is not taken, for the purpose of finding the minimum throttle action to maintain the proper speed-time relationship, or to permit sampling system adjustments.

(e) The drive wheel tires must be inflated to the manufacturer's recommended pressure, ±15 kPa (±2.2 psi). The drive wheel tire pressure shall be reported with the test results.

(f) If the dynamometer has not been operated during the two-hour period immediately preceding the test, it shall be warmed up for 15 minutes by operating at 50 km/h (31 mph) using a nontest vehicle, or as recommended by the dynamometer manufacturer.

(g) If the dynamometer horsepower must be adjusted manually, it shall be set within one hour prior to the exhaust emissions test phase. The test vehicle shall not be used to make this adjustment. Dynamometers using automatic control of preselectable power settings may be set anytime prior to the beginning of the emissions test.

(h) The driving distance, as measured by counting the number of dynamometer roll revolutions, shall be determined for the transient cold start, stabilized cold start, and transient hot start phases of the test.

[54 FR 14551, Apr. 11, 1989]

§ 86.536-78 Engine starting and restarting.

(a)(1) The engine shall be started according to the manufacturer's recommended starting procedures. The initial 20 second idle period shall begin when the engine starts.

(2) *Choke operation.* (i) Vehicles equipped with automatic chokes shall be operated according to the instructions in the manufacturer's operating instructions or owner's manual including choke setting and "kick-down" from cold fast idle. The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

(ii) Vehicles equipped with manual chokes shall be operated according to the manufacturer's operating instructions or owner's manual. Where times are provided in the instructions, the Administrator may specify the specific point for operation, within 15 seconds of the recommended time.

(3) The operator may use the choke, throttle etc. where necessary to keep the engine running.

(4) If the manufacturer's operating instructions or owner's manual do not specify a warm engine starting procedure, the engine (automatic and manual choke engines) shall be started by opening the throttle about half way and cranking the engine until it starts.

(b) [Reserved]

(c) If, during the cold start, the vehicle does not start after 10 seconds of cranking, or ten cycles of the manual starting mechanism, cranking shall cease and the reason for failure to start determined. The revolution counter on the constant volume sampler shall be turned off and the sample solenoid valves placed in the "standby" position during this diagnostic period. In addition, either the CVS blower shall be turned off or the exhaust tube disconnected from the tailpipe during the diagnostic period.

(1) If failure to start is an operational error, the vehicle shall be rescheduled for testing from a cold start. If failure to start is caused by vehicle malfunction, corrective action (following the unscheduled maintenance provisions) of less than 30 minutes duration may be taken and the test continued. The sampling system shall be reactivated at the same time cranking is started. When the engine starts, the driving schedule timing sequence shall begin. If failure to start is caused by vehicle malfunction and the vehicle cannot be started, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken (following the unscheduled maintenance provisions), and the vehicle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported.

(2) If the vehicle does not start during the hot start after ten seconds of cranking, or ten cycles of the manual starting mechanism, cranking shall cease, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken in accordance with § 86.428 or § 86.429, and the vehicle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported.

(d) If the engine "false starts", the operator shall repeat the recommended starting procedure (such as resetting the choke, etc.)

(e) *Stalling.* (1) If the engine stalls during an idle period, the engine shall be restarted immediately and the test continued. If the engine cannot be started soon enough to allow the vehicle to follow the next acceleration as prescribed, the driving schedule indicator shall be stopped. When the vehicle restarts, the driving schedule indicator shall be reactivated.

(2) If the engine stalls during some operating mode other than idle, the driving schedule indicator shall be stopped, the vehicle shall then be restarted and accelerated to the speed required at that point in the driving schedule and the test continued. During acceleration to this point, shifting shall be performed in accordance with § 86.528.

(3) If the vehicle will not restart within one minute, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken, and the vehicle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported.

§ 86.537-78 Dynamometer test runs.

(a) The vehicle shall be allowed to stand with the engine turned off (see § 86.532 for required time). The vehicle shall be stored prior to the emission test in such a manner that precipitation (e.g., rain or dew) does not occur on the vehicle. The complete dynamom-eter test consists of a cold start drive of 12.0 km (7.5 miles), (10.9 km (6.8 miles) for Class I motorcycles) and simulates a hot start drive of 12.0 km (7.5 miles), (10.9 km (6.8 miles) for Class I motorcycles). The vehicle is allowed to stand on the dynamometer during the 10 minute period between the cold and hot start tests. The cold start is divided into two periods. The first period, representing the cold start "transient" phase, terminates at the end of the deceleration which is scheduled to occur at 505 seconds of the driving schedule. The second period, representing the "stabilized" phase, consists of the remainder of the driving schedule including engine shutdown. The hot start test similarly consists of two periods. The period, representing the hot start "transient" phase, terminates at the same point in the driving schedule at the first period of the cold start test. The second period of the hot start test, "stabilized" phase, is assumed to be identical to the second period of the cold start test. Therefore, the hot start test terminates after the first period (505 seconds) is run.

(b) The following steps shall be taken for each test:

(1) Place drive wheel of vehicle on dynamometer without starting engine.

(2) Activate vehicle cooling fan system.

(3) With the sample selector valves in the "standby" position, connect sample collection bags to the dilute exhaust and dilution air sample collection systems.

(4) Start the Constant Volume Sampler (if not already on), the sample pumps, and the temperature recorder. (The heat exchanger of the constant volume sampler, if used, should be preheated to operating temperature before the test begins.)

(5) Adjust the sample flow rates to the desired flow rate (minimum of 80 cc/s (10.2 ft^3/hr) for PDP-CVS) and set the gas flow measuring devices to zero.

(6) Evacuate sample collection bags.

NOTE: CF-CVS sample flowrate is fixed by the venturi design.

(7) Attach the flexible exhaust tube to the vehicle tailpipe(s).

(8) Start the gas flow measuring device, position the sample selector valves to direct the sample flow into the "transient" exhaust sample bag and the "transient" dilution air sample bag and start cranking the engine.

(9) Fifteen seconds after the engine starts, place the transmission in gear.

(10) Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule.

(11) Operate the vehicle according to the dynamometer driving schedule (§ 86.515).

(12) At the end of the deceleration, which is scheduled to occur at 505 seconds, simultaneously switch the sample flows from the "transient" bags to the "stabilized" bags, switch off gas flow measuring device No. 1 and start gas flow measuring device No. 2. Before the acceleration, which begins at 510 seconds, record the roll revolutions. As soon as possible, transfer the "transient" exhaust and dilution air samples to the analytical system and process the samples according to § 86.540, obtaining a stabilized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(13) Turn engine off 2 seconds after the end of the last deceleration (at 1,369 seconds).

(14) Five seconds after the engine stops running, simultaneously turn off gas flow measuring device No. 2 and position the sample selector valves to the "standby" position. Record the measured roll revolutions. As soon as possible, transfer the stabilized exhaust and dilution air samples to the analytical system and process the samples according to § 86.540 obtaining a stabilized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(15) Immediately after the end of the sample period turn off the vehicle cooling fan system.

(16) Turn off the CVS or disconnect the exhaust tube from the tailpipe of the vehicle.

(17) Repeat the steps in paragraphs (b)(2) through (10) of this section for the hot start test, except only one evacuated sample bag is required for sampling exhaust gas and one for dilution air. The step in paragraph (b)(7) of this section shall begin between 9 and 11 minutes after the end of the sample period for the cold start test.

(18) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously turn off gas flow

measuring device No. 1 and position the sample selector valve to the "standby" position. (Engine shutdown is not part of the hot start test sample period.) Record the measured roll revolutions.

(19) As soon as possible, transfer the hot start "transient" exhaust and dilution air samples to the analytical system and process the samples according to § 86.540 obtaining a stabilized reading of the exhaust sample on all analyzers Within 20 minutes of the end of the sample collection phase of the test.

(20) Disconnect the exhaust tube from the vehicle tailpipe(s) and remove vehicle from dynamometer.

(21) The constant volume sampler may be turned off, if desired.

(22) Continuous monitoring of exhaust emissions will not normally be allowed. Specific written approval must be obtained from the Administrator for continuous monitoring of exhaust emissions.

(Approved by the Office of Management and Budget under the control number 2000-0390)

[42 FR 1137, Jan. 5, 1977, as amended at 42 FR 56738, Oct. 28, 1977; 49 FR 48140, Dec. 10, 1984]

§ 86.537-90 Dynamometer test runs.

(a) The vehicle shall be allowed to stand with the engine turned off (see § 86.532 for required time). The vehicle shall be stored prior to the emission test in such a manner that precipitation (*e.g.*, rain or dew) does not occur on the vehicle. The complete dynamometer test consists of a cold start drive of 12.0 km (7.5 mi), (10.9 km (6.8 mi) for Class I motorcycles) and simulates a hot start drive of 12.0 km (7.5 mi), (10.9 km (6.8 mi) for Class I motorcycles). The vehicle is allowed to stand on the dynamometer during the 10-minute period between the cold and hot start tests. The cold start is divided into two periods. The first period, representing the cold start "transient" phase, terminates at the end of the deceleration which is scheduled to occur at 505 seconds of the driving schedule. The second period, representing the "stabilized" phase, consists of the remainder of the driving schedule including engine shutdown. The hot start test similarly consists of two periods. The period, representing the hot start "transient" phase, terminates at the same point in the driving schedule at the first point of the cold start test. The second period of the hot start test, "stabilized" phase, is assumed to be identical to the second period of the cold start test. Therefore, the hot start test terminates after the first period (505 seconds) is run.

(b) The following steps shall be taken for each test:

(1) Place drive wheel of vehicle on dynamometer without starting engine.

(2) Activate vehicle cooling fan.

(3) For all vehicles, with the sample selector valves in the "standby" position connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(4) For methanol-fueled vehicles, with the sample selector valves in the "standby" position, insert fresh sample collection impingers into the methanol sample collection system, fresh collection impingers or capsules into the formaldehyde sample collection system, and fresh impingers (or capsules for formaldehyde) into the dilution air sample collection systems for methanol and formaldehyde (may be omitted for 1990 through 1994 model years).

(5) Start the CVS (if not already on), the sample pumps and the temperature recorder. (The heat exchanger of the constant volume sampler, if used, methanol-fueled vehicle hydrocarbon analyzer and sample lines should be preheated to their respective operating temperatures before the test begins.)

(6) Adjust the sample flow rates to the desired flow rate and set the gas flow measuring devices to zero.

(i) For gaseous bag samples (except hydrocarbon samples), the minimum flow rate is 0.17 cfm (0.08 l/s).

(ii) For hydrocarbon samples, the minimum FID (or HFID in the case of methanol-fueled vehicles) flow rate is 0.066 cfm (0.031 l/s).

(iii) For methanol samples, the minimum flow rate is 0.14 cfm (0.067 l/s).

(iv) For formaldehyde samples, the minimum flow rate is 0.036 cfm (0.017 l/s) with capsule collector and 0.014 cfm (0.067 l/s) with impinger.

NOTE: CFV sample flow rate is fixed by the venturi design.

(7) Attach the flexible exhaust tube to the vehicle tailpipe(s).

(8) Start the gas flow measuring device, position the sample selector valves to direct the sample flow into the "transient" exhaust sample bag, the "transient" methanol exhaust sample, the "transient" formaldehyde exhaust sample, the "transient" dilution air sample bag, the "transient" methanol dilution air sample and the "transient" formaldehyde dilution air sample, turn the key on, and start cranking the engine.

(9) Fifteen seconds after the engine starts, place the transmission in gear.

(10) Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule.

(11) Operate the vehicle according to the Urban Dynamometer Driving Schedule (§ 86.515).

(12) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously switch the sample flows from the "transient" bags and samples to the "stabilized" bags and samples, switch off gas flow measuring device No. 1, and start gas flow measuring device No. 2. Before the acceleration which is scheduled to occur at 510 seconds, record the measured roll or shaft revolutions and reset the counter or switch to a second counter. As soon as possible transfer the "transient" exhaust and dilution air samples to the analytical system and process the samples according to § 86.540 obtaining a stabilized reading of the bag exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test. Obtain methanol and formaldehyde sample analyses, if applicable, within 24 hours of the end of the sample collection phase of the test (if it is not possible to perform analysis on the methanol .and formaldehyde samples within 24 hours, the samples should be stored in a dark, cold (approximately 0 °C) environment until analysis).

(13) Turn the engine off 2 seconds after the end of the last deceleration (at 1,369 seconds).

(14) Five seconds after the engine stops running, simultaneously turn off gas flow measuring device No. 2 and position the sample selector valves to the "standby" position. Record the measured roll or shaft revolutions, (both gas meter or flow measurement instrumentation readings), and re-set the counter. As soon as possible, transfer the "stabilized" exhaust and dilution air samples to the analytical system and process the samples according the § 86.540, obtaining a stabilized reading of the exhaust bag sample on all analyzers within 20 minutes of the end of the sample collection phase of the test. Obtain methanol and formaldehyde sample analyses, if applicable, within 24 hours of the end of the sample period (if it is not possible to perform analysis on the methanol and formaldehyde samples within 24 hours, the samples should be stored in a dark, cold (~ 0 °C) environment until analysis).

(15) Immediately after the end of the sample period, turn off the cooling fan.

(16) Turn off the CVS or disconnect the exhaust tube from the tailpipe(s) of the vehicle.

(17) Repeat the steps in paragraph (b) (2) through (11) of this section for the hot start test, except only two evacuated sample bags, two methanol sample impingers, two formaldehyde sample impingers are required. The step in paragraph (b)(8) of this section shall begin between 9 and 11 minutes after the end of the sample period for the cold start test.

(18) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously turn off gas flow measuring device No. 1 and position the sample selector valve to the "standby" position. (Engine shutdown is not part of the hot start test sample period.) Record the measured roll or shaft revolutions.

(19) As soon as possible, transfer the hot start "transient" exhaust and dilution air bag samples to the analytical system and process the samples according to § 86.540 obtaining a stabilized reading of the bag exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test. Obtain methanol and formaldehyde sample analyses, if applicable, within 24 hours of

the end of the sample period (if it is not possible to perform analysis on the methanol and formaldehyde samples within 24 hours, the samples should be stored in a dark, cold (~ 0 °C) environment until analysis).

(20) Disconnect the exhaust tube from the vehicle tailpipe(s) and remove the vehicle from dynamometer.

(21) The CVS or CFV may be turned off, if desired.

(22) Continuous monitoring of exhaust emissions will not normally be allowed. Specific written approval must be obtained from the Administrator for continuous monitoring of exhaust emissions.

[54 FR 14551, Apr. 11, 1989]

§ 86.540-78 Exhaust sample analysis.

The following sequence of operations shall be performed in conjunction with each series of measurements:

(a) Check flowrates and pressures. Adjust if required.

(b) Zero the analyzers and obtain a stable zero reading. Recheck after tests.

(c) Introduce span gases and set instrument gains. In order to avoid corrections, span and calibrate at the same flow rates used to analyze the test sample. Span gases should have concentrations equal to 75 to 100 percent of full scale. If gain has shifted significantly on the analyzers, check the calibrations. Show actual concentrations on chart.

(d) Check zeros: repeat the procedure in paragraphs (a) through (c) of this section if required.

(e) Check flowrates and pressures.

(f) Measure HC, CO, CO_2, and, optionally, NO_x concentrations of samples.

(g) [Reserved]

(h) Check zero and span points. If difference is greater than 2 percent of full scale, repeat the procedure in paragraphs (a) through (g) of this section.

[42 FR 1137, Jan. 5, 1977 and 42 FR 56739, Oct. 28, 1977]

§ 86.540-90 Exhaust sample analysis.

The following sequence of operations shall be performed in conjunction with each series of measurements:

(a) For CO, CO_2, gasoline-fueled and methanol-fueled vehicle HC, and, if appropriate, NOx:

(1) Zero the analyzers and obtain a stable zero reading. Recheck after tests.

(2) Introduce span gases and set instrument gains. In order to avoid errors, span and calibrate at the same flow rates used to analyze the test sample. Span gases should have concentrations equal to 75 to 100 percent of full scale. If gain has shifted significantly on the analyzers, check the calibrations. Show actual concentrations on chart.

(3) Check zeros; repeat the procedure in paragraphs (a) (1) and (2) of this section if required.

(4) Check flow rates and pressures.

(5) Measure HC, CO, CO_2, and, if appropriate, NOx, concentrations of samples.

(6) Check zero and span points. If difference is greater than 2 percent of full scale, repeat the procedure in paragraphs (a) (1) through (5) of this section.

(b) For CH_3OH (methanol-fueled vehicles):

(1) Introduce a reference sample of methanol (the concentration of methanol in deionized water is known, and is C_{MR} in the calculations) into the gas chromatograph and measure the area of the response peak. This reference sample peak area is A_{MR} in the calculations.

(2) Introduce test samples into the gas chromatograph and measure the area of the response peak. This peak area is A_{MS} in the calculations.

(c) For HCHO (methanol-fueled vehicles):

(1) Introduce a reference sample of formaldehyde (the concentration of formaldehyde as a dinitrophenylhydrazine derivative in acetonitrile (C_{FR}) is known) into the high pressure liquid chromatograph and measure the area of the response peak. This reference sample peak area is A_{FR} in the calculations.

(2) Introduce test samples into the high pressure liquid chromatograph and measure the area of the responses peak. This peak area is A_{FS} in the calculations.

[54 FR 14552, Apr. 11, 1989]

§ 86.542-78 Records required.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System or device tested (brief description).

(c) Date and time of day for each part of the test schedule.

(d) Instrument operator.

(e) Driver or operator.

(f) *Vehicle:* Make, Vehicle identification number, Model year, Transmission type, Odometer reading at initiation of preconditioning, Engine displacement, Engine family, Emission control system, Recommended Idle RPM, Nominal fuel tank capacity, Inertial loading, Actual curb mass recorded at 0 kilometers, and Drive wheel tire pressure.

(g) *Dynamometer serial number:* As an alternative to recording the dynamometer serial number, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided the test cell records show the pertinent information.

(h) All pertinent instrument information such as tuning—gain—serial number—detector number—range. As an alternative, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(i) *Recorder charts:* Identify zero, span, exhaust gas, and dilution air sample traces.

(j) Test cell barometric pressure, ambient temperature and humidity.

NOTE: A central laboratory barometer may be used; provided that individual test cell barometric pressures are shown to be within ±0.1 percent of the barometric pressure at the central barometer location.

(k) [Reserved]

(l) Pressure of the mixture of exhaust and dilution air entering the CVS metering device, the pressure increase across the device, and the temperature at the inlet. The temperature may be recorded continuously or digitally to determine temperature variations.

(m) The number of revolutions of the positive displacement pump accumulated during each test phase while exhaust samples are being collected. The number of standard cubic metres metered by a critical flow venturi during each test phase would be the equivalent record for a CFV-CVS.

(n) The humidity of the dilution air.

NOTE: If conditioning columns are not used (see § 86.522 and § 86.544) this measurement can be deleted. If the conditioning columns are used and the dilution air is taken from the test cell, the ambient humidity can be used for this measurement.

(o) The driving distance for each of the three phases of test, calculated from the measured roll or shaft revolutions.

[42 FR 1137, Jan 5, 1977, as amended at 42 FR 56739, Oct. 28, 1977]

§ 86.542-90 Records required.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System or device tested (brief description).

(c) Date and time of day for each part of the test schedule.

(d) Instrument operator.

(e) Driver or operator.

(f) *Vehicle:* Make, Vehicle identification number, Model year, Transmission type, Odometer reading at initiation of preconditioning, Engine displacement, Engine family, Emission control system, Recommended idle RPM, Nominal fuel tank capacity, Inertial loading, Actual curb mass recorded at 0 kilometers, and Drive wheel tire pressure.

(g) *Dynamometer serial number:* As an alternative to recording the dynamometer serial number, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided the test cell records show the pertinent instrument information.

(h) All pertinent instrument information such as tuning-gain-serial number-detector number-range. As an alternative, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(i) Recorder Charts: Identify zero, span, exhaust gas, and dilution air sample traces.

(j) Test cell barometric pressure, ambient temperature and humidity.

NOTE: A central laboratory barometer may be used; *Provided*, that individual test cell barometric pressures are shown to be within ±0.1 percent of the barometric pressure at the central barometer location.

(k) [Reserved]

(l) Pressure of the mixture of exhaust and dilution air entering the CVS metering device, the pressure increase across the device, and the temperature at the inlet. The temperature may be recorded continuously or digitally to determine temperature variations.

(m) The number of revolutions of the positive displacement pump accumulated during each test phase while exhaust samples are being collected. The number of standard cubic meters metered by a critical flow venturi during each test phase would be the equivalent record for a CFV-CVS.

(n) The humidity of the dilution air.

NOTE: If conditioning columns are not used (see §§ 86.522 and 86.544) this measurement can be deleted. If the conditioning columns are used and the dilution air is taken from the test cell, the ambient humidity can be used for this measurement.

(o) The driving distance for each of the three phases of test, calculated form the measured roll or shaft revolutions.

(p) *Additional required records for methanol-fueled vehicles:* (1) Specification of the methanol fuel used during testing.

(2) Volume of sample passed through the methanol sampling system and the volume of deionized water in each impinger.

(3) The methanol concentration in the reference sample and the peak area from the GC analysis of the reference sample.

(4) The peak area of the GC analyses of the test samples (methanol).

(5) Volume of sample passed through the formaldehyde sampling system.

(6) The formaldehyde concentration in the reference sample and the peak area from the HPLC analysis of the reference sample.

(7) The peak area of the HPLC analysis of the test sample (formaldehyde).

[54 FR 14553, Apr. 11, 1989]

§ 86.544-78 Calculations; exhaust emissions.

The final reported test results, with oxides of nitrogen being optional, shall be computed by use of the following formulae: (The results of all emission tests shall be rounded, using the "Rounding-Off Method" specified in ASTM E 29-67, to the number of places to the right of the decimal point indicated by expressing the applicable standard to three significant figures.)

(a)

$$Y_{wm}=0.43[(Y_{ct}+Y_s)/(D_{ct}+D_s)]+0.57[(Y_{ht}+Y_s)/(D_{ht}+D_s)]$$

Where:

Y_{wm}=Weighted mass emissions of CO_2 or of each pollutant, i.e., HC, CO, or NO_x, in grams per vehicle kilometer

Y_{ct}=Mass emissions as calculated from the "transient" phase of the cold-start test, in grams per test phase

Y_{ht}=Mass emissions as calculated from the "transient" phase of the hot-start test, in grams per test phase

Y_s=Mass emissions as calculated from the "stabilized" phase of the cold-start test, in grams per test phase

D_{ct}=The measured driving distance from the "transient" phase of the cold-start test, in kilometers

D_{ht}=The measured driving distance from the "transient" phase of the hot-start test, in kilometers

D_s=The measured driving distance from the "stabilized" phase of the cold-start test, in kilometers

(b) The mass of each pollutant for each phase of both the cold-start test and the hot-start test if determined from the following:

(1) Hydrocarbon mass:

$$HC_{mass}=V_{mix}\times Density_{HC}\times(HC_{conc}/1,000,000)$$

(2) Oxides of nitrogen mass:

$NO_{xmass} = V_{mix} \times Density_{NO2} \times (NO_{xconc} \times K_{h}/1,000,000)$

(3) Carbon monoxide mass:

$CO_{mass} = V_{mix} \times Density_{CO} \times (CO_{conc}/1,000,000)$

(4) Carbon dioxide mass:

$CO_{2mass} = V_{mix} \times Density_{CO2} \times (CO_{2conc}/100)$

(c) Meaning of symbols:

(1) HC_{mass} = Hydrocarbon emissions, in grams per test phase

$Density_{HC}$ = Density of hydrocarbon in the exhaust gas, 576.8 g/m³/carbon atom (16.33 g/ft³/carbon atom), assuming an average carbon to hydrogen ratio of 1:1.85, at 20°C (68°F) and 101.325 kPa (760 mm Hg) pressure

HC_{conc} = Hydrocarbon concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent, i.e., equivalent propane × 3

$HC_{conc} = HC_e - HC_d(1-1/DF)$

Where:

HC_e = Hydrocarbon concentrations of the dilute exhaust sample as measured, in ppm carbon equivalent (propane ppm × 3)

HC_d = Hydrocarbon concentration of the dilution air as measured, in ppm carbon equivalent (propane ppm × 3)

(2) NO_{xmass} = Oxides of nitrogen emissions, in grams per test phase

$Density_{NO2}$ = Density of oxides of nitrogen in the exhaust gas, assuming they are in the form of nitrogen dioxide, 1,913 g/m³ (54.16 g/ft³), at 20°C (68°F) and 101.325 kPa (760 mm Hg) pressure

NO_{xconc} = Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, in ppm

$NO_{xconc} = NO_{xe} - NO_{xd}(1-1/DF)$

Where:

NO_{xe} = Oxides of nitrogen concentration of the dilute exhaust sample as measured, in ppm

NO_{xd} = Oxides of nitrogen concentration of the dilution air as measured, in ppm

(3) CO_{mass} = Carbon monoxide emissions, in grams per test phase

$Density_{CO}$ = Density of carbon monoxide, 1,164 g/m³ (32.97 g/ft³), at 20°C (68°F) and 101.325 kPa (760 mm Hg) pressure

CO_{conc} = Carbon monixide concentration of the dilute exhaust sample corrected for background, water vapor, and CO_2 extraction, in ppm

$CO_{conc} = CO_e - CO_d(1-1/DF)$

Where:

CO_e = Carbon monoxide concentration of the dilute exhaust sample volume corrected for water vapor and carbon dioxide extraction, in ppm. The calculation assumes the carbon to hydrogen ratio of the fuel is 1:1.85.

$CO_e = (1 - 0.01925CO_{2e} - 0.000323R)\ CO_{em}$

Where:

CO_{em} = Carbon monoxide concentration of the dilute exhaust sample as measured, in ppm

CO_{2e} = Carbon dioxide concentration of the dilute exhaust sample, in percent

R = Relative humidity of the dilution air, in percent (see § 86.542.78(n))

CO_d = Carbon monoxide concentration of the dilution air corrected for water vapor extraction, in ppm

$CO_d = (1 - 0.000323R)\ CO_{dm}$

Where:

CO_{dm} = Carbon monoxide concentration of the dilution air sample as measured, in ppm

NOTE: If a CO instrument which meets the criteria specified in § 86.511 is used and the conditioning column has been deleted, CO_{em} can be substituted directly for CO_e and CO_{dm} can be substituted directly for CO_d.

(4) CO_{2mass} = Carbon dioxide emissions, in grams per test phase

Density CO_2 = Density of carbon dioxide, 1,830 g/m³ (51.81 g/ft³), at 20°C (68°F) and 101.325 kPa (760 mm Hg) pressure

CO_{2conc} = carbon dioxide concentration of the dilute exhaust sample corrected for background, in percent

$CO_{2conc} = CO_{2e} - CO_{2d}(1-1/DF)$

Where:

CO_{2d} = Carbon dioxide concentration of the dilution air as measured, in percent

(5) $DF = 13.4/[CO_{2e} + (HC_e + CO_e)10^{-4}]$

V_{mix} = Total dilute exhaust volume in cubic meters per test phase corrected to standard conditions (293.15° K (528°R) and 101.325 kPa (760 mm Hg))

$V_{mix} = V_o \times N[(P_b - P_i)(293.15°K)]/[(101.325\ kPa)(T_p)]$

Where:

V_o = Volume of gas pumped by the positive displacement pump, in cubic meters per revolution. This volume is dependent on the pressure differential across the positive displacement pump. (See calibration techniques in § 86.519-78)

N = Number of revolutions of the positive displacement pump during the test phase while samples are being collected

P_b = Barometric pressure, in kPa

P_i=Pressure depression below atmospheric measured at the inlet to the positive displacement pump, in kPa

T_p=Average temperature of dilute exhaust entering positive displacement pump during test while samples are being collected, in degrees kelvin

K_h=Humidity correction factor

$K_h=1/[1-0.0329(H-10.71)]$

where:

H=Absolute humidity in grams of water per kilogram of dry air

$H=[(6.211)R_a\times P_d]/[P_b-(P_d\times R_a/100)]$

R_a=Relative humidity of the ambient air, in percent

P_d=Saturated vapor pressure, in kPa at the ambient dry bulb temperature

(d) Sample calculation of mass emission values for vehicles with engine displacements equal to or greater than 170 cc (10.4 cu. in.):

(1) For the "transient" phase of the cold-start test, assume $V_o=0.0077934$ m³ per revolution; N=12,115; R=20.5 percent; $R_a=20.5$ percent; $P_b=99.05$ kPa; $P_d=3.382$ kPa; $P_i=9.851$ kPa; $T_p=309.8$ K; $HC_e=249.75$ ppm carbon equivalent; $NO_{xe}=38.30$ ppm; $CO_{em}=311.23$ ppm; $CO_{2e}=0.415$ percent; $HC_d=4.90$ ppm; $NO_{xd}=0.30$ ppm; $CO_{dm}=8.13$ ppm; $CO_{2d}=0.037$ percent; $D_{ct}=5.650$ km.

Then:

$V_{mix}=[(0.0077934)(12{,}115)(99.05-9.851)(293.15)]/[(101.325)(309.8)]$

$V_{mix}=78.651$ m³ per test phase

$H=[(6.211)(20.5)(3.382)]/[(99.05)-(3.382)(20.5/100)]$

$H=4.378$ grams H_2O per kg dry air

$K_h=1/[1-0.0329(4.378-10.71)]$

$K_h=0.8276$

$CO_e=[1-0.01925(0.415)-0.000323(20.5)](311.23)$

$CO_e=306.68$ ppm

$CO_d=[1-0.000323(20.5)](8.13)$

$CO_d=8.08$ ppm

$DF=13.4/[0.415+(249.75+306.68)10^{-4}]$

$DF=28.472$

$HC_{conc}=249.75-4.90(1-1/28.472)$

$HC_{conc}=245.02$ ppm

$HC_{mass}=(78.651)(576.8)(245.02)\ 10^{-6}$

$HC_{mass}=11.114$ grams per test phase

$NO_{xconc}=38.30-0.30(1-1/28.472)$

$NO_{xconc}=38.01$ ppm

$NO_{xmass}=(78.651)(1913)(38.01)(0.8276)10^{-6}$

$NO_{xmass}=4.733$ grams per test phase

$CO_{conc}=306.68-8.08(1-1/28.472)$

$CO_{conc}=298.88$ ppm

$CO_{mass}=(78.651)(1164)(298.88)10^{-6}$

$CO_{mass}=27.362$ grams per test phase

$CO_{2conc}=0.415-0.037(1-1/28.472)$

$CO_{2conc}=0.3793$ percent

$CO_{2mass}=(78.651)(1843)(0.3793)/100$

$CO_{2mass}=549.81$ grams per test phase

(2) For the "stabilized" portion of the cold-start test, assume that similar calculations resulted in $HC_{mass}=7.184$ grams per test phase; $NO_{xmass}=2.154$ grams per test phase; $CO_{mass}=64.541$ grams per test phase; and $CO_{2mass}=529.52$ grams per test phase. $D_s=6.070$ kilometers.

(3) For the "transient" portion of the hot-start test, assume that similar calculations resulted in $HC_{mass}=6.122$ grams per test phase; $NO_{xmass}=7.056$ grams per test phase; $CO_{mass}=34.964$ grams per test phase; and $CO_{2mass}=480.93$ per test phase. $D_{ht}=5.660$ kilometers.

(4) For a 1978 motorcycle with an engine displacement equal to or greater than 170 cc (10.4 cu. in.):

$HC_{wm}=0.43[(11.114+7.184)/(5.650+6.070)]+0.57[(6.122+7.184)/(5.660+6.070)]$

$HC_{wm}=1.318$ grams per vehicle kilometer

$NO_{xwm}=0.43[(4.733+2.154)/(5.650+6.070)]+0.57[(7.056+2.154)/(5.660+6.070)]$

$NO_{xwm}=0.700$ gram per vehicle kilometer

$CO_{wm}=0.43[(27.362+64.541)/(5.650+6.070)]+0.57[(34.964+64.541)/(5.660+6.070)]$

$CO_{wm}=8.207$ grams per vehicle kilometer

$CO_{2wm}=0.43[(549.81+529.52)/(5.650+6.070)]+0.57[(480.93+529.52)/(5.660+6.070)]$

$CO_{2wm}=88.701$ grams per vehicle kilometer

[48 FR 52202, Nov. 16, 1983]

§ 86.544-90 Calculations; exhaust emissions.

The final reported test results, with oxides of nitrogen being optional, shall be computed by use of the following formula: (The results of all emission tests shall be rounded, using the "Rounding-Off Method" specified in ASTM E 29-67, to the number of places to the right of the decimal point indicated by expressing the applicable standard to three significant figures.)

$$(a)\ Y_{wm}=0.43\left(\frac{Y_{ct}+Y_s}{D_{ct}+D_s}\right)+0.57\left(\frac{Y_{ht}+Y_s}{D_{ht}+D_s}\right)$$

Where:

(1) Y_{wm} = Weighted mass emissions of CO_2 or of each pollutant (*i.e.*, HC, CO, or NO_x) in grams per vehicle kilometer and if appropriate, the weighted carbon mass equivalent of organic material hydrocarbon equivalent, in grams per vehicle kilometer.

(2) Y_{ct} = Mass emissions as calculated from the "transient" phase of the cold-start test, in grams per test phase.

(3) Y_{ht} = Mass emissions as calculated from the "transient" phase of the hot-start test, in grams per test phase.

(4) Y_s = Mass emissions as calculated from the "stabilized" phase of the cold-start test, in grams per test phase.

(5) D_{ct} = The measured driving distance from the "transient" phase of the cold-start test, in kilometers.

(6) D_{ht} = The measured driving distance from the "transient" phase of the hot-start test, in kilometers.

(7) D_s = The measured driving distance from the "stabilized" phase of the cold-start test, in kilometers.

(b) The mass of each pollutant for each phase of both the cold-start test and the hot-start test is determined from the following:

(1) Hydrocarbon mass:

$HC_{mass} = V_{mix} \times Density_{HC} \times (HC_{conc}/1{,}000{,}000)$

(2) Oxides of nitrogen mass:

$NOx_{mass} = V_{mix} \times Density_{NO2} \times K_H \times (NOx_{conc}/1{,}000{,}000)$

(3) Carbon monoxide mass:

$CO_{mass} = V_{mix} \times Density_{CO} \times (CO_{conc}/1{,}000{,}000)$

(4) Carbon dioxide mass:

$CO_{2mass} = V_{mix} \times Density_{CO2} \times (CO_{2conc}/100)$

(5) Methanol mass:

$CH_3OH_{mass} = V_{mix} \times Density_{CH3OH} \times (CH_3OH_{conc}/1{,}000{,}000)$

(6) Formaldehyde mass:

$HCHO_{mass} = V_{mix} \times Density_{HCHO} \times (HCHO_{conc}/1{,}000{,}000)$

(7) Organic material hydrocarbon equivalent:

(i) OMHCE =

$$HC_{Mass} + \frac{13.8756}{32.042}(CH_3OH)_{Mass} + \frac{13.8756}{30.0262}(HCHO)_{Mass}$$

(c) Meaning of symbols:

(1)(i) HC_{mass} = Hydrocarbon emissions, in grams per test phase.

(ii) $Density_{HC}$ = Density of hydrocarbon in the exhaust gas, 576.8 g/m³/carbon atom (16.33 g/ft³/carbon atom), assuming an average carbon to hydrogen ratio of 1:1.85, at 20 °C (68 °F) and 101.3 kPa (760 mm Hg) pressure.

(iii)(A) HC_{conc} = Hydrocarbon concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent, *i.e.*, equivalent propane x 3.

(B) $HC_{conc} = HC_e - HC_d(1-(1/DF))$
Where:

(iv)(A) HC_e = Hydrocarbon concentrations of the dilute exhaust sample as measured, in ppm carbon equivalent (propane ppm x 3).

(B) $HC_e = FIDHC_e - (r)C_{CH3OHe}$

(v) FID HC_e = Concentration of hydrocarbon plus methanol in dilute exhaust as measured by the FID, ppm carbon equivalent.

(vi) r = FID response to methanol.

(vii) C_{CH3OHe} = Concentration of methanol in dilute exhaust as determined from the dilute exhaust methanol sample, ppm carbon.

(viii)(A) HC_d = Hydrocarbon concentration of the dilution air as measured, ppm carbon equivalent.

(B) $HC_d = FID\ HC_d - (r)C_{CH3OHd}$

(ix) FID HC_d = Concentration of hydrocarbon plus methanol in dilution air as measured by the FID, ppm carbon equivalent.

(x) C_{CH3OHd} = Concentration of methanol in dilution air as determined from dilution air methanol sample, ppm carbon.

(2)(i) NOx_{mass} = Oxides of nitrogen emissions, grams per test phase.

(ii) $Density_{NO2}$ = Density of oxides of nitrogen in the exhaust gas, assuming they are in the form of nitrogen dioxide, 1913 g/m³ (54.16 g/ft³), at 20 °C

(68 °F) and 101.3 kPa (760 mm Hg) pressure.

(iii)(A) NOx_{conc}=Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, ppm.

(B) $NOx_{conc}=NOx_e-NOx_d(1-(1/DF))$

Where:

(iv) NOx_e=Oxides of nitrogen concentration of the dilute exhaust sample as measured, ppm.

(v) NOx_d=Oxides of nitrogen concentration of the dilution air as measured, ppm.

(3)(i) CO_{mass}=Carbon monoxide emissions, in grams per test phase.

(ii) $Density_{CO}$=Density of carbon monoxide, 1164 g/m^3 (32.97 g/ft^3), at 20 °C (68 °F) and 101.3 kPa (760 mm Hg) pressure.

(iii)(A) CO_{conc}=Carbon monoxide concentration of the dilute exhaust sample corrected for background, water vapor, and CO_2 extraction, ppm.

(B) $CO_{conc}=CO_e-CO_d(1-(1/DF))$

Where:

(iv)(A) CO_e=Carbon monoxide concentration of the dilute exhaust sample volume corrected for water vapor and carbon dioxide extraction, in ppm.

(B) $CO_e=(1-0.01925CO_{2e}-0.000323R)CO_{em}$ for gasoline-fueled vehicles with hydrogen to carbon ratio of 1.85:1

(C) $CO_e=[1-(0.01+0.005HCR)CO_{2e}-0.000323R]CO_{em}$

for methanol-fueled vehicles, where HCR is hydrogen to carbon ratio as measured for the fuel used.

(v) CO_{em}=Carbon monoxide concentration of the dilute exhaust sample as measured, ppm

(vi) CO_{2e}=Carbon dioxide concentration of the dilute exhaust sample, pct.

(vii) R=Relative humidity of the dilution air, pct (*see* § 86.542(n)).

(viii)(A) CO_d=Carbon monoxide concentration of the dilution air corrected for water vapor extraction, ppm.

(B) $CO_d=(1-0.000323R)CO_{dm}$

Where:

(ix) CO_{dm}=Carbon monoxide concentration of the dilution air sample as measured, ppm.

NOTE: If a CO instrument which meets the criteria specified in § 86.511 is used and the conditioning column has been deleted, CO_{em} can be substituted directly for CO_e and CO_{dm} must be substituted directly for CO_d.

(4)(i) CO_{2mass}=Carbon dioxide emissions, grams per test phase.

(ii) $Density_{CO2}$=Density of carbon dioxide, 1830 g/m^3 (51.81 g/ft^3), at 20 °C (68 °F) and 101.3 kPa (760 mm Hg) pressure.

(iii)(A) CO_{2conc}=carbon dioxide concentration of the dilute exhaust sample corrected for background, in percent.

(B) $CO_{2conc}=CO_{2e}-CO_{2d}(1-1/DF)$

Where:

(iv) CO_{2d}=Carbon dioxide concentration of the dilution air as measured, in percent.

(5)(i) CH_3OH_{mass}=Methanol emissions corrected for background, grams per test phase.

(ii) $Density_{CH3OH}$=Density of methanol is 1332 g/m^3 (37.71 g/ft^3), at 20 °C (68 °F) and 101.3 kPa (760 mm Hg) pressure.

(iii)(A) CH_3OH_{conc}=Methanol concentration of the dilute exhaust corrected for background, ppm.

(B) $CH_3OH_{conc}=C_{CH3OHe}-C_{CH3OHd}(1-(1/DF))$

Where:

(iv)(A) C_{CH3OHe}=Methanol concentration in the dilute exhaust, ppm.

(B)

$$C_{CH3OHe}=\frac{3.813\times10^{-2}\times C_{CH3OHR}\times T_{EM}[(A_{S1}\times AV_{S1})+(A_{S2}\times AV_{S2})]}{A_{CH3OHR}\times P_B\times V_{EM}}$$

(v)(A) C_{CH3OHd}=Methanol concentration in the dilution air, ppm.

(B)

$$C_{CH3OHd}=\frac{3.813\times10^{-2}\times C_{CH3OHR}\times T_{DM}[(A_{D1}\times AV_{D1})+(A_{D2}\times AV_{D2})]}{A_{CH3OHR}\times P_B\times V_{DM}}$$

(vi) C_{CH3OHR}=Concentration of methanol in standard sample for calibration of GC, μg/ml.

(vii) A_{CH3OHR}=GC peak area of standard sample.

(viii) T_{EM}=Temperature of methanol sample withdrawn from dilute exhaust, °R.

(ix) T_{DM}=Temperature of methanol sample withdrawn from dilution air, °R.

(x) P_B=Barometric pressure during test, mm Hg.

(xi) V_{EM}=Volume of methanol sample withdrawn from dilute exhaust, ft^3.

(xii) V_{DM}=Volume of methanol sample withdrawn from dilution air, ft^3.

(xiii) A_s=GC peak area of sample drawn from dilute exhaust.

(xiv) A_D=GC peak area of sample drawn from dilution air.

(xv) AV_s=Volume of absorbing reagent (deionized water) in impinger through which methanol sample from dilute exhaust is drawn, ml.

(xvi) AV_D=Volume of absorbing reagent (deionized water) in impinger through which methanol sample from dilution air is drawn, ml.

(xvii) 1=first impinger.

(xviii) 2=second impinger.

(6)(i) $HCHO_{mass}$=Formaldehyde emissions corrected for background, grams per test phase.

(ii) $Density_{HCHO}$=Density of formaldehyde is 1249 g/m^3 (35.36 g/ft^3), at 20 °C (68 °F) and 101.3 kPa (760 mm Hg) pressure.

(iii)(A) $HCHO_{conc}$=Formaldehyde concentration of the dilute exhaust corrected for background, ppm.

(B) $HCHO_{conc}=C_{HCHOe}-C_{HCHOd}\,(1-(1/DF))$

Where:

(iv)(A) C_{HCHOe}=Formaldehyde concentration in dilute exhaust, ppm.

(B)

$$C_{HCHOe}=\frac{4.069\times10^{-2}\times C_{FDE}\times V_{AE}\times Q\times T_{EF}}{V_{SE}\times P_B}$$

(v)(A) C_{HCHOd}=Formaldehyde concentration in dilution air, ppm.

(B)

$$C_{HCHOd}=\frac{4.069\times10^{-2}\times C_{FDA}\times V_{AA}\times Q\times T_{DF}}{V_{SA}\times P_B}$$

(vi) C_{FDE}=Concentration of DNPH derivative of formaldehyde from dilute exhaust sample in sampling solution, μg/ml.

(vii) V_{AE}=Volume of sampling solution for dilute exhaust formaldehyde sample, ml.

(viii)(A) Q=Ratio of molecular weights of formaldehyde to its DNPH derivative.

(B) Q=0.1429

(ix) T_{EF}=Temperature of formaldehyde sample withdrawn from dilute exhaust, °R.

(x) V_{SE}=Volume of formaldehyde sample withdrawn from dilute exhaust, ft^3.

(xi) P_B=Barometric pressure during test, mm Hg.

(xii) C_{FDA}=Concentration of DNPH derivative of formaldehyde from dilution air sample in sampling solution, μg/ml.

(xiii) V_{AA}=Volume of sampling solution for dilution air formaldehyde sample, ml.

(xiv) T_{DF}=Temperature of formaldehyde sample withdrawn from dilution air, °R.

(xv) V_{SA}=Volume of formaldehyde sample withdrawn from dilution air, ft^3.

(7)(i) $DF=13.4/[CO_{2e}+(HC_e+CO_e)\ 10^{-4}]$ for gasoline-fueled vehicles.

$$\text{(ii)}\quad DF = \frac{100\ x\left(\dfrac{x}{x + y/2 + 3.76(x + y/4 - z/2)}\right)}{CO_{2e} + (HC_e + CO_e + C_{CH3OHe})\ 10^{-4}}$$

for methanol-fueled vehicles where fuel composition is $C_xH_yO_z$ as measured for the fuel used.

(iii)(A) V_{mix}=Total dilute exhaust volume in cubic meters per test phase corrected to standard conditions (293 °K (528 °R) and 101.3 kPa (760 mm Hg)).

(B)

$$V_{mix}=\frac{V_o \times N \times (P_B-P_i)\times 293}{101.3\times T_p}$$

Where:

(iv) V_o=Volume of gas pumped by the positive displacement pump, in cubic meters per revolution. This volume is dependent on the pressure differential across the positive displacement pump. (See calibration techniques in § 86.519.)

(v) N=Number of revolutions of the positive displacement pump during the test phase while samples are being collected.

(vi) P_B=Barometric pressure, kPa.

(vii) P_i=Pressure depression below atmospheric measured at the inlet to the positive displacement pump, kPa.

(viii) T_p=Average temperature of dilute exhaust entering positive displacement pump during test while samples are being collected, °K.

(ix)(A) K_h=Humidity correction factor.

(B) $K_h=1/[1-0.0329(H-10.71)]$

Where:

(x)(A) H=Absolute humidity in grams of water per kilogram of dry air.

(B) $H=[(6.211)R_a\times P_d]/[P_B-(P_d\times R_a/100)]$

(xi) R_a=Relative humidity of the ambient air, pct.

(xii) P_d=Saturated vapor pressure, in kPa at the ambient dry bulb temperature.

(xiii) P_B=Barometric pressure, kPa.

(d) Sample calculation of mass emission values for gasoline-fueled vehicles with engine displacements equal to or greater than 170 cc (10.4 cu. in.):

(1) For the "transient" phase of the cold-start test, assume V_o=0.0077934 m^3 per rev; N=12,115; R=20.5 pct; R_a=20.5 pct; P_B=99.05 kPa; P_d=3.382 kPa; P_i=9.851 kPa; T_p=309.8 °K; HC_e=249.75 ppm carbon equivalent; NOx_e=38.30 ppm; CO_{em}=311.23 ppm; CO_{2e}= 0.415 percent; HC_d= 4.90 ppm; NOx_d=0.30 ppm; CO_{dm}=8.13 ppm; CO_{2d}=0.037 pct; D_{ct}=5.650 km.

Then:

(i) V_{mix}=[(0.0077934)(12,115)(99.05-9.851)(293.15)]/ [(101.325)(309.8)] =78.651 m^3 per test phase.

(ii) H=[(6.211)(20.5)(3.382)]/ [(99.05)− (3.382)(20.5/100)]=4.378 grams H_2O per kg dry air.

(iii) K_h=1/[1−0.0329(4.378−10.71)] =0 8276

(iv) CO_e=[1−0.01925(0.415)−0.000323 (20.5)](311.23)=306.68 ppm.

(v) CO_d=[1 −0.000323(20.5)](8.13) =8.08 ppm.

(vi) DF=13.4/[0.415+(249.75+306.68)10^{-4}]=28.472

(vii) HC_{conc}=249.75−4.90(1−1/28.472) =245.02 ppm.

(viii) $HC_{mass}=(78.651)\ (576.8)\ (245.02)\ 10^{-6}=11.114$ grams per test phase.

(ix) $NOx_{conc}=38.30-0.30(1-1/28.472)=38.01$ ppm.

(x) $NOx_{mass}=(78.651)(1913)(38.01)(0.8276)\times 10^{-6}=4.733$ grams per test phase.

(xi) $CO_{conc}=306.68-8.08\ (1-1/28.472)=298.88$ ppm.

(xii) $CO_{mass}=(78.651)\ (1164)\ (298.88)\ (10^{-6})=27.362$ grams per test phase.

(xiii) $CO_{2conc}=0.415-0.037\ (1-1/28.472)=0.3793$ percent.

(xiv) $CO_{2mass}=(78.651)(1843)(0.3793)/100=549.81$ grams per test phase.

(2) For the "stabilized" portion of the cold-start test, assume that similar calculations resulted in $HC_{mass}=7.184$ grams per test phase; $NOx_{mass}=2.154$ grams per test phase; $CO_{mass}=64.541$ grams per test phase; and $CO_{2mass}=529.52$ grams per test phase. $D_s=6.070$ km.

(3) For the "transient" portion of the hot-start test, assume that similar calculations resulted in $HC_{mass}=6.122$ grams per test phase; $NOx_{mass}=7.056$ grams per test phase; $CO_{mass}=34.964$ grams per test phase; and $CO_{2mass}=480.93$ grams per test phase. $D_{ht}=5.660$ km.

(4) For a 1978 motorcycle with an engine displacement equal to or greater than 170 cc (10.4 cu. in):

(i) $HC_{wm}=0.43\ [(11.114+7.184)/(5.650+6.070)]+0.57\ [(6.122+7.184)/(5.660+6.070)]=1.318$ grams per vehicle kilometer.

(ii) $NOx_{wm}=0.43\ [(4.733+2.154)/(5.650+6.070)]+0.57\ [(7.056+2.154)/(5.660+6.070)]=0.700$ gram per vehicle kilometer.

(iii) $CO_{wm}=0.43\ [(27.362+64.541)/(5.650+6.070)]+0.57\ [(34.964+64.541)/(5.660+6.070)]=8.207$ grams per vehicle kilometer.

(iv) $CO_{2wm}=0.43\ [(549.81+529.52)/(5.650+6.070)]+0.57\ [(480.93+529.52)/(5.660+6.070)]=88.701$ grams per vehicle kilometer.

(e) For methanol-fueled vehicle with measured fuel composition of $CH_{3.14}O_{0.6}$ example calculation of exhaust emissions using positive displacement pump:

(1) For the "transient" phase of the cold start test assume the following:

$V_o=0.29344$ ft³/rev; $N=10,485$; $R=48.0$ pct; $R_a=48.2$ pct; $P_B=762$ mm Hg; $P_d=22.225$ mm Hg; $P_4=70$ mm Hg; $T_p=570°R$; FID=HCe=81.6 ppm, carbon equivalent; $r=0.75$; $C_{CH3OHR}=71$ ug/ml; $T_{EM}=567°R$; $A_{CH3OHR}=3660$; $V_{EM}=1.18$ ft³; $A_{s1}=4460$; $AV_{s1}=25.2$ ml; $A_{s2}=360$; $AV_{s2}=24.9$ ml; $T_{DM}=532°R$; $V_{DM}=1.17$ ft³; $A_{D1}=110$; $AV_{D1}=25.0$ ml; $A_{D2}=10$; $AV_{D2}=25.1$ ml; $C_{FDE}=20$ ug/ml; $V_{AE}=5.0$ ml; $Q=0.1429$; $T_{EF}=569°R$; $V_{SE}=0.30$ ft³; $C_{FDA}=1$ ug/ml; $V_{AA}=5.0$ ml; $T_{DF}=532°R$; $V_{SA}=0.31$ ft³; $NOx_e=11.2$ ppm; $CO_{em}=306.6$ ppm; $CO_{2e}=1.43$ pct; FID $HC_d=12.1$ ppm; $NOx_d=0.8$ ppm; $CO_{dm}=15.3$ ppm; $CO_{2d}=0.032$ pct; $D_{ct}=3.598$ mi.

Then:

(i) $V_{mix}=(0.29344)(10,485)(762-70)(528)/(760)(570)=2595.0$ ft³ per test phase.

(ii) $H=(43.478)(48.2)(22.225)/[762-(22.225x48.2/100)]=62$ grains of water per pound of dry air.

(iii) $K_H=1/[1-0.0047(62-75)]=0.9424$

(iv) $CO_e=[1-(0.01+0.005\times 3.14\times 1.43)-0.000323(48)]\ 306.6=291.9$ ppm.

(v) $CO_d=(1-0.000323(48))\ 15.3=15.1$ ppm.

(vi)

$$C_{CH3OHe} = (3.813o10^{-2})(71)(567)[(4460)(25.2)+(360)(24.9)])\ (3660)(762)(1.18) = 56.60\ \text{PPM.}$$

$$\text{(vii)DF} = \frac{100 \times \dfrac{1}{1 + (3.14/2) + 3.76(1 + 3.14/4 - 0.6/2)}}{1.43 + [81.6 + 291.9 + (1 - 0.75)(56.60)] \times 10^{-4}}$$

$$= 8.350$$

(viii)

$$C_{CH_3OH} = \frac{(3.813 \times 10^{-2})(71)(532)[(110)(25.0)+(10)(25.1)]}{(3660)(762)(1.17)} = 1.32 \text{ ppm.}$$

(ix) $CH_3OH_{conc} = 56.60 - 1.32 \quad (1 - 1/8.350) = 55.44$ ppm.

(x) $CH_3OH_{mass} = (2595.0)(37.71)(55.44/1{,}000{,}000) = 5.43$ grams per test phase.

(xi) $HC_{conc} = [81.6 - (0.75)(56.60)] - [12.1 - (0.75)(1.32)](1 - 1/8.530) = 29.34$ ppm.

(xii) $HC_{mass} = (2594)(16.33)(29.34/1{,}000{,}000) = 1.24$ grams per test phase.

(xiii) $C_{HCHOe} = (4.069 \times 10^{-2})(20)(5)(0.1429)(569)/(0.30)(762) = 1.4473$ ppm.

(xiv) $C_{HCHOd} = (4.069 \times 10^{-2})(1)(5)(0.1429)(532)/(0.31)(762) = 0.0655$ ppm.

(xv) $HCHO_{conc} = 1.4473 - 0.0655(1 - 1/8.350) = 1.3896$ ppm.

(xvi) $HCHO_{mass} = (2595)(35.36)(1.3896/1{,}000{,}000) = 0.1275$ grams per test phase.

(xvii)

$$\text{OMHCE} = 1.24 + \frac{13.8756}{32.042}(5.43) + \frac{13.8756}{30.0262}(0.1275)$$

= 3.65 grams per test phase.

(xviii) $NOx_{conc} = 11.2 - (0.8)(1 - 1/8.350) = 10.50$ ppm.

(xix) $NOx_{mass} = (2595)(54.16)(10.50/1{,}000{,}000)(0.9424) = 1.390$ grams per test phase.

(xx) $CO_{conc} = 291.9 - 15.1(1 - 1/8.530) = 278.69$ ppm.

(xxi) $CO_{mass} = (2595.0)(32.97)(278.69/1{,}000{,}000) = 23.84$ grams per test phase.

(xxii) $CO_{2conc} = 1.43 - 0.032 \quad (1 - 1/8.350) = 1.402$ percent.

(xxiii) $CO_{2mass} = (2595.0)(51.85)(1.402/100) = 1886$ grams per test phase.

(2) For the stabilized portion of the cold start test assume that similar calculations resulted in the following:

(i) OMHCE = 0.55 grams per test phase.

(ii) $NOx_{mass} = 1.27$ grams per test phase.

(iii) $CO_{mass} = 5.98$ grams per test phase.

(iv) $CO_{2mass} = 2346$ grams per test phase.

(v) $D_s = 3.902$ miles.

(3) For the "transient" portion of the hot start test assume that similar calculations resulted in the following:

(i) OMHCE = 0.67 grams per test phase.

(ii) $NOx_{mass} = 1.38$ grams per test phase.

(iii) $CO_{mass} = 5.01$ grams per test phase.

(iv) $CO_{2mass} = 1758$ grams per test phase.

(v) $D_{ht} = 3.598$ miles.

(4) Weighted emission results:

(i) $OMHCE_{wm} = 0.43[(3.65 + 0.55)/(3.598 + 3.902)] + 0.57[(0.67 + 0.55)/(3.598 + 3.902)] = 0.334$ grams per vehicle mile.

(ii) $NOx_{wm} = 0.43[(1.390 + 1.27)/(3.598 + 3.902)] + 0.57[(1.38 + 1.27)/(3.598 + 3.902)] = 0.354$ grams per vehicle mile.

(iii) $CO_{wm} = 0.43[(23.84 + 5.98)/(3.598 + 3.902)] + 0.57[(5.01 + 5.98)/(3.598 + 3.902)] = 2.54$ grams per vehicle mile.

(iv) $CO_{2wm} = 0.43[(1886 + 2346)/(3.598 + 3.902)] + 0.57[(1758 + 2346)/(3.598 + 3.902)] = 555$ grams per vehicle mile.

[54 FR 14553, Apr. 11, 1989]

Subpart G—Selective Enforcement Auditing of New Light-Duty Vehicles

SOURCE: 41 FR 31483, July 28, 1976, unless otherwise noted.

§ 86.601-84 Applicability.

For 1984 and later model year light-duty vehicles, all provisions of this subpart are applicable. The provisions of this subpart are not applicable to 1984 and later model year light-duty trucks.

(Secs. 206, 208(a) and 301(a), Clean Air Act, as amended, 42 U.S.C. 7525, 7542(a) and 7601(a))

[49 FR 69, Jan. 3, 1984. Redesignated at 54 FR 2122, Jan. 19, 1989]

§ 86.602-84 Definitions.

(a) The definitions in this section apply to this subpart.

(b) As used in this subpart, all terms not defined herein have the meaning given them in the Act.

(1) "Acceptable Quality Level" (AQL) means the maximum percentage of failing vehicles that, for purposes of sampling inspection, can be considered satisfactory as a process average.

(2) "Axle Ratio" means all ratios within ±3% of the axle ratio specified in the configuration in the test order.

(3) "Configuration" means a subclassification of an engine-system combination on the basis of engine code, inertia weight class, transmission type and gear ratios, axle ratio, and other parameters which may be designated by the Administrator.

(4) "Test Sample" means the collection of vehicles of the same configuration which have been drawn from the population of vehicles of that configuration and which will receive exhaust emission testing.

(5) "Inspection Criteria" means the pass and fail numbers associated with a particular sampling plan.

(6) "Vehicle" means any new production light-duty vehicle as defined in Subpart A of this part.

(7) "Test Vehicle" means a vehicle in a test sample.

(8) "In the Hands of the Manufacturer" means that vehicles are still in the possession of the manufacturer and have not had their bills of lading transferred to another person for the purpose of transporting.

[49 FR 48480, Dec. 12, 1984. Redesignated at 54 FR 2122, Jan. 19, 1989]

§ 86.603-88 Test orders.

(a) The Administrator will require any testing under this subpart by means of a test order addressed to the manufacturer.

(b) The test order will be signed by the Assistant Administrator for Air and Radiation or his designee. The test order will be delivered in person by an EPA Enforcement Officer to a company representative or sent by registered mail, return receipt requested, to the manufacturer's representative who signs the Application for Certification submitted by the manufacturer pursuant to the requirements of the applicable sections of Subpart A of this part. Upon receipt of a test order, the manufacturer shall comply with all of the provisions of this subpart and instructions in the test order.

(c)(1) The test order will specify the vehicle configuration selected for testing, the time and location at which vehicles must be selected, and the procedure by which vehicles of the specified configuration must be selected. The test order may specify the number of vehicles to be selected per day and may include alternative configurations (primary, secondary, etc.) to be selected for testing in the event that vehicles of the first specified configuration are not available for testing because those vehicles are not being manufactured at the specified assembly plant, not being manufactured during the specified time, or not being stored at the specified assembly plant or associated storage facility. If total production of the specified vehicle configuration is less than the number specified in the test order, the manufacturer will select the actual number of vehicles produced per day. If the first specified configuration is not being manufactured at a rate of at least four vehicles per day over the expected duration of the audit, the Assistant Administrator for Air and Radiation or his designated representative may select vehicles of a primary alternate configuration for testing in lieu of the first specified configuration. Likewise, vehicles of a secondary alternate configuration may be selected in lieu of vehicles of the first specified configuration or primary alternate configuration. In addition, the test order may include other directions or information essential to the administration of the required testing.

(2) The following instructions are applicable to each test order issued under this subpart:

(i) The manufacturer shall make the following documents available to an EPA Enforcement Officer upon request:

(A) A properly filed and current Application for Certification following the format prescribed by the EPA for the appropriate model year; and

(B) A copy of the shop manual, dealer service bulletins, and pre-delivery inspection procedures for the configuration being tested.

(ii) Only one mechanic at a time per vehicle shall make authorized checks, adjustments, or repairs, unless a particular check, adjustment, or repair requires a second mechanic as indicated in the shop manual or dealer service bulletins.

(iii) A mechanic shall not perform any check, adjustment, or repair without an Enforcement Officer present unless otherwise authorized.

(iv) The manufacturer shall utilize only those tools and test equipment utilized by its dealers when performing authorized checks, adjustments, or repairs.

(d) A manufacturer may indicate preferred assembly plants for the various engine families produced by the manufacturer for selection of vehicles in response to a test order. This shall be accomplished by submitting a list of engine families and the corresponding assembly plants from which the manufacturer desires to have vehicles selected to the Administrator. In order that a manufacturer's preferred location for issuance of a test order for a configuration of a particular engine family be considered, the list must be submitted prior to issuance of the test order. Notwithstanding the fact that a manufacturer has submitted the above list, the Administrator may, upon making the determination that evidence exists indicating noncompliance at other than the manufacturer's preferred plant, order testing at such other plant where vehicles of the configuration specified in the test order are assembled.

(e) During a given model year, the Administrator shall not issue to a manufacturer more SEA test orders than an annual limit determined by dividing the projected sales bound for the U.S. market for that model year, as made by the manufacturer in its report submitted under paragraph (a)(2) of § 600.207-80 of the Automobile Fuel Economy Regulations, by 300,000 and rounding to the nearest whole number, unless the projected sales are less than 150,000, in which case the annual limit is one. However, the annual limit for SEA test orders will be recalculated if a manufacturer submits to EPA in writing prior to or during the model year a sales projection update.

(1) Any SEA test order for which the configuration fails in accordance with § 86.610 or for which testing is not completed does not count against the annual limit.

(2) When the annual limit has been met, the Administrator may issue additional test orders for those configurations for which evidence exists indicating noncompliance. An SEA test order issued on this basis will include a statement as to the reason for its issuance.

(Approved by the Office of Management and Budget under the control number 2060-0064)

[41 FR 31483, July 28, 1976, as amended at 43 FR 4552, Feb. 2, 1978; 49 FR 48480, Dec. 12, 1984. Redesignated and amended at 54 FR 2122, Jan. 19, 1989]

§ 86.604–84 Testing by the Administrator.

(a) The Administrator may require by test order that vehicles of a specified configuration be selected in a manner consistent with the requirements of § 86.607 and submitted to him at such place as he may designate for the purpose of conducting emission tests. These tests shall be conducted in accordance with § 86.608 of these regulations to determine whether vehicles manufactured by the manufacturer conform with the regulations with respect to which the certificate of conformity was issued.

(b)(1) Whenever the Administrator conducts a test on a test vehicle or the Administrator and manufacturer each conduct a test on the same test vehicle, the results of the Administrator's test shall comprise the official data for that vehicle.

(2) Whenever the manufacturer conducts all tests on a test vehicle, the manufacturer's test data will be accepted as the official data: *Provided*, That if the Administrator makes a determination based on testing under paragraph (a) of this section that there is a substantial lack of agreement between the manufacturer's test results and the Administrator's test results, no manufacturer's test data from the manufacturer's test facility will be accepted for purposes of this subpart.

(c) In the event that testing conducted under paragraph (a) of this section demonstrates a lack of agreement under paragraph (b)(2), of this section, the Administrator will:

(1) Notify the manufacturer in writing of his determination that the test facility is inappropriate for conducting the tests required by this subpart and the reasons therefor, and

(2) Reinstate any manufacturer's data upon a showing by the manufacturer that the data acquired under paragraph (a) of this section was erroneous and the manufacturer's data was correct.

(d) The manufacturer may request in writing that the Administrator reconsider his determination in paragraph (b)(2) of this section based on data or information which indicates that changes have been made to the test facility and such changes have resolved the reasons for disqualification.

[41 FR 31483, July 28, 1976, as amended at 49 FR 48481, Dec. 12, 1984. Redesignated at 54 FR 2123, Jan. 19, 1989]

§ 86.605–88 Maintenance of records; submittal of information.

(a) The manufacturer of any new motor vehicle subject to any of the standards or procedures prescribed in this part shall establish, maintain and retain the following adequately organized and indexed records:

(1) *General records*. (i) A description of all equipment used to test vehicles in accordance with § 86.608 pursuant to a test order issued under this subpart, including the following information:

(A) Dynamometer.

(*1*) Inertia loading.

(*2*) Road load power absorption at 50 m.p.h.

(*3*) Manufacturer, model and serial number.

(B) Constant Volume Sampler.

(*1*) Pressure of the mixture of exhaust and dilution air entering the positive displacement pump, pressure increase across the pump, and the temperature set point of the temperature control system.

(*2*) Number of revolutions of the positive displacement pump accumulated while test is in progress and exhaust samples are being collected.

(*3*) Humidity of dilution air.

(*4*) Manufacturer, model, type and serial number.

(C) Instrumentation.

(*1*) Manufacturer, model and serial number for each analyzer.

(*2*) Pertinent information such as tuning, gain, ranges and calibration data.

(*3*) Identification of zero, span, exhaust gas and dilution air sample traces.

(*4*) Temperature set point of heated sample line and heated hydrocarbon detector temperature control system (for diesel vehicles only).

(D) Test cell.

(*1*) Barometric pressure, ambient temperature and humidity.

(*2*) Data and time of day.

(ii) In lieu of recording test equipment information, reference to a vehicle test cell number may be used, with the advance approval of the Administrator: Provided, the test cell records show the pertinent information.

(2) *Individual records.* These records pertain to each audit conducted pursuant to this subpart.

(i) The location where audit testing was performed, and the date and time for each emissions test.

(ii) The number of miles on the test vehicle when the test began and ended.

(iii) The names of supervisory personnel responsible for the conduct of the audit.

(iv) A record and description of any repairs performed prior to and/or subsequent to approval by the Administrator, giving the date and time of the repair, the reason for it, the person authorizing it, and the names of supervisory personnel responsible for the repair.

(v) The dates when the test vehicles were shipped from the assembly plant or the storage facility and when they were received at the testing facility.

(vi) The drive wheel tire pressure and the inertia weight class for each test vehicle, and the actual curb weight for each test vehicle required to be weighed pursuant to a test order.

(vii) A complete record of all emission tests performed pursuant to this subpart (except tests performed by EPA directly) including all individual worksheets and/or other documentation relating to each test, or exact copies thereof.

(viii) A brief description of all significant audit events, commencing with the test vehicle selection process, but not described by any other subparagraph under paragraph (a)(2) of this section, including such extraordinary events as vehicle accident.

(ix) A paper copy of the driver's trace for each test.

(3) Additional required records for diesel vehicles.

(4) The manufacturer shall record test equipment description, pursuant to paragraph (a)(1) of this section, for each test cell that is used to perform emission testing under this subpart.

(b) All records required to be maintained under this subpart shall be retained by the manufacturer for a period of one (1) year after completion of all testing in response to a test order. Records may be retained as hard copy or reduced to microfilm, punch cards, etc., depending upon the record retention procedures of the manufacturer: *Provided,* That in every case all the information contained in the hard copy shall be retained.

(c) The manufacturer shall, pursuant to a request made by the Administrator, submit to the Administrator the following information with regard to vehicle production:

(1) Number of vehicles, by configuration and assembly plant, scheduled for production for the time period designated in the request.

(2) Number of vehicles, by configuration and assembly plant, produced during the time period designated in the request which are complete for introduction into commerce.

(d) Nothing in this section shall limit the Administrator's discretion to require the manufacturer to retain additional records or submit information not specifically required by this section.

(e) All reports, submissions, notifications and requests for approvals made under this subpart shall be addressed to:

Director, Manufacturers Operations Division EN-340), U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460.

(Approved by the Office of Management and Budget under the control number 2060-0064)

[41 FR 31483, July 28, 1976, as amended at 44 FR 61962, Oct. 29, 1979; 49 FR 48481, Dec. 12, 1984. Redesignated at 54 FR 2123, Jan. 19, 1989]

§ 86.606-84 Entry and access.

(a) In order to allow the Administrator to determine whether a manufacturer is complying with the provisions of this subpart and a test order issued thereunder, EPA Enforcement Officers may enter during normal operating hours upon presentation of credentials any of the following:

(1) Any facility where any vehicle to be introduced into commerce or any emission-related component is or has been manufactured, assembled, or stored;

(2) Any facility where any tests conducted pursuant to a test order or any procedures or activities connected with such tests are or were performed;

(3) Any facility where any vehicle which is being, was, or is to be tested is present; and

(4) Any facility where any record or other document relating to any of the above is located.

(b) Upon admission to any facility referred to in paragraph (a) of this section, EPA Enforcement Officers may:

(1) Inspect and monitor any part or aspect of vehicle manufacturer, assembly, storage, testing and other procedures, and the facilities in which these procedures are conducted;

(2) Inspect and monitor any part or aspect of vehicle test procedures or activities, including, but not limited to, vehicle selection, preparation, mileage accumulation, preconditioning, emission tests, and maintenance; and verify calibration of test equipment;

(3) Inspect and make copies of any records or documents related to the assembly, storage, selection and testing of a vehicle in compliance with a test order; and

(4) Inspect and photograph any part or aspect of any vehicle and any component used in its assembly that is reasonably related to the purpose of the entry.

(c) EPA Enforcement Officers may obtain reasonable assistance without cost from those in charge of a facility to help them perform any function listed in this subpart and may request the recipient of a test order to arrange with those in charge of a facility operated for its benefit to furnish reasonable assistance without cost to EPA whether or not the recipient controls the facility.

(d) EPA Enforcement Officers may seek a warrant or court order authorizing the EPA Enforcement Officers to conduct activities related to entry and access as authorized in this section. EPA Enforcement Officers may proceed *ex parte* to obtain a warrant whether or not the Enforcement Officers first sought permission from the recipient of the test order or the party in charge of the facilities in question to conduct those activities related to entry and access.

(e) A recipient of a test order shall permit EPA Enforcement Officers who present a warrant or court order as described in paragraph (d) of this section to conduct activities related to entry and access as authorized in this section and as described in the warrant or court order. A recipient of a test order shall cause those in charge of its facility or a facility operated for its benefit to permit EPA Enforcement Officers to conduct these activities related to entry and access pursuant to a warrant or court order whether or not the recipient controls the facility. In the absence of such a warrant or court order, EPA Enforcement Officers may conduct those activities related to entry and access only upon the consent of either the recipient of the test order or the party in charge of the facilities in question.

(f) It is not a violation of this part or the Clean Air Act for any person to refuse to permit EPA Enforcement Officers to conduct activities related to entry and access as authorized in this section without a warrant or court order.

(g) A manufacturer is responsible for locating its foreign testing and manufacturing facilities in jurisdictions in which local foreign law does not prohibit EPA Enforcement Officers from conducting the entry and access activities specified in this section. EPA will not attempt to make any inspections which it has been informed that local foreign law prohibits.

(h) For purposes of this section:

(1) "Presentation of Credentials" means display of the document designating a person as an EPA Enforcement Officer.

(2) Where vehicle storage areas or facilities are concerned, "operating hours" means all times during which personnel other than custodial personnel are at work in the vicinity of the area or facility and have access to it.

(3) Where facilities or areas other than those covered by paragraph (h)(2) of this section are concerned,

"operating hours" means all times during which an assembly line is in operation, vehicle assembly is occurring, or testing, repair, mileage accumulation, production or compilation of records, or any other procedure or activity related to testing, or to vehicle manufacture or assembly, is being conducted in a facility.

(4) "Reasonable assistance" includes, but is not limited to, providing clerical, copying, interpreting and translating services and, at the request of an EPA Enforcement Officer, making available personnel of the facility being inspected during their working hours to provide information relevant to the Enforcement Officer's activities authorized in this section. Any employee whom a manufacturer has instructed to appear at the request of an Enforcement Officer may be accompanied, represented, and advised by counsel.

(Approved by the Office of Management and Budget under the control number 2060-0064)

[41 FR 31483, July 28, 1976, as amended at 49 FR 48481, Dec. 12, 1984. Redesignated at 54 FR 2123, Jan. 19, 1989]

§ 86.607-84 Sample selection.

(a) Vehicles comprising a test sample which are required to be tested, pursuant to a test order issued in accordance with this subpart, will be selected at the location and in the manner specified in the test order. If a manufacturer determines that the test vehicles cannot be selected in the manner specified in the test order, an alternative selection procedure may be employed: *Provided,* That the manufacturer requests approval of the alternative procedure in advance of the start of test sample selection and that the Administrator approves the procedure. Special order vehicles are exempt from sample selection unless a test sample cannot be completed otherwise.

(b) The manufacturer shall have assembled the test vehicles of the configuration selected for testing using its normal mass production processes for vehicles to be distributed into commerce. During the audit, the manufacturer shall inform the Administrator of any change(s) implemented in its production processes, including quality control, which may be reasonably expected to affect the emissions of the vehicles selected, between the time the manufacturer received the test order and the time the manufacturer finished selecting test vehicles.

(c) No quality control, testing, or assembly procedures will be used on the completed test vehicles or any portion thereof, including parts and subassemblies, that has not been or will not be used during the production and assembly of all other vehicles of that configuration.

(d) The test order may specify that EPA Enforcement Officers, rather than the manufacturer, will select the test vehicles according to the method described in paragraph (a) of this section.

(e) The order in which test vehicles are selected determines the order in which test results are to be used in applying the sampling plan in accordance with § 86.610.

(f) The manufacturer shall keep on hand all untested vehicles, if any, comprising the test sample until a pass or fail decision is reached in accordance with paragraph (d) of § 86.610. The manufacturer may ship any tested vehicle which has not failed in accordance with paragraph (a) of § 86.610. However, once a manufacturer ships any vehicle from the test sample, it relinquishes the prerogative to conduct retests provided in paragraph (i) of § 86.608.

(Approved by the Office of Management and Budget under the control number 2060-0064)

[49 FR 48482, Dec. 12, 1984. Redesignated at 54 FR 2123, Jan. 19, 1989]

§ 86.608-88 Test procedures.

(a) The prescribed test procedures are contained in Subpart B of this Part 86. For purposes of Selective Enforcement Audit testing, the manufacturer shall not perform any of the test procedures in Subpart B of this part relating to evaporative emission testing, except as specified in paragraph (a)(2) of this section.

(1) The Administrator may, on the basis of a written application by a manufacturer, prescribe test proce-

dures other than those in Subpart B of this part for any motor vehicle which he determines is not susceptible to satisfactory testing using the procedures in Subpart B of this part.

(2) The following exceptions to the test procedures in Subpart B of this part are applicable to Selective Enforcement Audit testing:

(i) The manufacturer may use test fuel meeting the specifications of paragraph (a)(1) or (b)(2) of § 86.113-82 for mileage accumulation. Otherwise, the manufacturer may use fuels other than those specified in this section only with advance approval of the Administrator.

(ii) The manufacturer may measure the temperature of the test fuel at other than the approximate mid-volume of the fuel tank, as specified in § 86.131(a), and may drain the test fuel from other than the lowest point of the tank, as specified in § 86.131(b), provided an equivalent method is used. Equivalency documentation shall be maintained by the manufacturer and shall be made available to the Administrator upon request.

(iii) The manufacturer may perform additional preconditioning on SEA test vehicles other than the preconditioning specified in § 86.132 only if the additional preconditioning had been performed on certification test vehicles of the same configuration.

(iv) The manufacturer shall perform the heat build procedure 11 to 34 hours following vehicle preconditioning rather than according to the time period specified in paragraph § 86.133(a). All references in § 86.133 to an evaporative emission enclosure (SHED) and analyzing for HC during the heat build can be ignored.

(v) The manufacturer may substitute slave tires for the drive wheel tires on the vehicle as specified in paragraph § 86.135(e): *Provided*, That the slave tires are the same size.

(vi) The cold start exhaust emission test described in § 86.137 shall follow the heat build procedure described in § 86.133 by not more than one hour.

(vii) In performing exhaust sample analysis under § 86.140.

(A) When testing diesel vehicles, the manufacturer shall allow a minimum of 20 minutes warm-up for the HC analyzer, and a minimum of 2 hours warm-up for the CO, CO_2 and NO, analyzers. (Power is normally left on infrared and chemiluminescent analyzers. When not in use, the chopper motors of the infrared analyzers are turned off and the phototube high voltage supply to the chemiluminescent analyzers is placed in the standby position.)

(B) The manufacturer shall exercise care to prevent moisture from condensing in the sample collection bags.

(viii) The manufacturer need not comply with § 86.142, since the records required therein are provided under other provisions of Subpart G of this part.

(ix) In addition to the requirements of Subpart B of this part, the manufacturer shall prepare gasoline-fueled vehicles as follows prior to exhaust emission testing:

(A) The manufacturer shall inspect the fuel system to insure the absence of any leaks of liquid or vapor to the atmosphere by applying a pressure of 14.5±0.5 inches of water to the fuel system, allowing the pressure to stabilize, and isolating the fuel system from the pressure source. Following isolation of the fuel system, pressure must not drop more than 2.0 inches of water in 5 minutes. If required, the manufacturer shall perform corrective action in accordance with paragraph § 86.608(d) and report this action in accordance with paragraph § 86.609(d).

(B) When performing this pressure check, the manufacturer shall exercise care to neither purge nor load the evaporative emission control system.

(C) The manufacturer shall not modify the test vehicle's evaporative emission control system by component addition, deletion, or substitution, except to comply with paragraph (a)(2)(ii) of this section if approved in advance by the Administrator.

(b)(1) The manufacturer shall not adjust, repair, prepare, or modify the vehicles selected for testing and shall not perform any emission tests on vehicles selected for testing pursuant to the test order unless this adjustment, repair, preparation, modification, and/or tests are documented in the manufacturer's vehicle assembly and inspection procedures and are actually performed or unless these adjustments and/or tests are required or permitted under this subpart or are approved in advance by the Administrator.

(2) For 1981 and later model years the Administrator may adjust or cause to be adjusted any engine or vehicle parameter which the Administrator has determined to be subject to adjustment for new vehicle compliance testing (e.g., for certification *or* Selective Enforcement Audit testing) in accordance with § 86.081-22(c)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.081-22(e)(3)(ii), prior to the performance of any tests. However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a lower engine idle speed than will be possible within the physically adjustable range of the idle speed parameter on the vehicle when it has accumulated 4,000 miles, all other parameters being adjusted identically for the purpose of comparison. The Administrator, in making or specifying such adjustments, will consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use light-duty vehicles or light-duty trucks. In determining likelihood, the Administrator will consider factors such as, but not limited to, the effect of the adjustment on vehicle performance characteristics and surveillance information from similar in-use vehicles.

(c) Prior to performing exhaust emission testing on an SEA test vehicle, the manufacturer may accumulate on each vehicle a number of miles equal to the greater of 4,000 miles, or the number of miles the manufacturer accumulated during certification on the emission-data vehicle corresponding to the configuration specified in the test order.

(1) Mileage accumulation must be performed in any manner using good engineering judgement to obtain emission results representative of normal production vehicles. This mileage accumulation must be consistent with the new vehicle break-in instructions contained in the applicable vehicle owner's manual, if any.

(2) The manufacturer shall accumulate mileage at a minimum rate of 300 miles per vehicle during each 24 hour period, unless otherwise provided by the Administrator.

(i) The first 24 hour period for mileage accumulation shall begin as soon as authorized vehicle checks, inspections and preparations are completed on each vehicle.

(ii) The minimum mileage accumulation rate does not apply on weekends or holidays.

(iii) If the manufacturer's mileage accumulation target is less than the minimum rate specified (300 miles per day), then the minimum daily accumulation rate shall be equal to the manufacturer's mileage accumulation target.

(3) Mileage accumulation shall be completed on a sufficient number of test vehicles during consecutive 24 hour periods to assure that the number of vehicles tested per day fulfills the requirements of paragraph (g) of this section.

(d) The manufacturer shall not perform any maintenance on test vehicles after selection for testing nor shall the Administrator allow deletion of any test vehicle from the test sequence, unless requested by the manufacturer and approved by the Administrator before any test vehicle maintenance or deletion.

(e) The manufacturer will be allowed 24 hours to ship test vehicles from the assembly plant or storage facility to the test facility if the test facility is not located at the plant or storage facility or in close proximity to the plant or storage facility: Except, That the Administrator may approve more time based upon a request by the manufacturer accompanied by a satisfactory justification.

(f) If a vehicle cannot complete the mileage accumulation or emission tests because of vehicle malfunction, the manufacturer may request the Administrator to authorize the repair of that vehicle or its deletion from the test sequence.

(g) Whenever the manufacturer conducts testing pursuant to a test order issued under this subpart, the manufacturer shall notify the Administrator within one working day of receipt of the test order, which test facility will be used to comply with the test order and the number of available test cells at that facility. If no test cells are available at the desired facility, the manufacturer must provide alternate testing capability satisfactory to the Administrator. The manufacturer shall complete emission testing on a minimum of four vehicles per 24 hour period including voided tests for each available test cell at his testing facility: Except, That the Administrator may approve a longer period based upon a request by the manufacturer accompanied by satisfactory justification.

(h) The manufacturer shall perform test vehicle selection, preparation, mileage accumulation, shipping, and testing in such a manner as to assure that the audit is performed in an expeditious manner.

(i) The manufacturer may retest any test vehicle after a fail decision has been reached in accordance with paragraph (d) of § 86.610 based on the first test on each vehicle; *except*, that the Administrator may approve retesting at other times during the audit based upon a request by the manufacturer accompanied by a satisfactory justification. The manufacturer may test each vehicle a total of three times. The manufacturer shall test each vehicle the same number of times. The manufacturer may accumulate additional mileage on test vehicles before conducting retests, subject to the provisions of paragraph (c) of this section.

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[41 FR 31483, July 28, 1976, as amended at 43 FR 4552, Feb. 2, 1978; 44 FR 2975, Jan. 12, 1979; 45 FR 14524, Mar. 5, 1980; 47 FR 49813, Nov. 2, 1982; 49 FR 48482, Dec. 12, 1984. Redesignated and amended at 54 FR 2123, Jan. 19, 1989]

§ 86.608-90 Test procedures.

(a) The prescribed test procedures are contained in Subpart B of this Part 86. For purposes of Selective Enforcement Audit testing, the manufacturer shall not perform any of the test procedures in Subpart B of this part relating to evaporative emission testing, except as specified in paragraph (a)(2) of this section.

(1) The Administrator may, on the basis of a written application by a manufacturer, prescribe test procedures other than those in Subpart B of this part for any motor vehicle which he determines is not susceptible to satisfactory testing using the procedures in Subpart B of this part.

(2) The following exceptions to the test procedures in Subpart B of this part are applicable to Selective Enforcement Audit testing:

(i) For mileage accumulation, the manufacturer may use test fuel meeting the specifications of mileage and service accumulation fuels of § 86.113. Otherwise, the manufacturer may use fuels other than those specified in this section only with the advance approval of the Administrator.

(ii) The manufacturer may measure the temperature of the test fuel at other than the approximate midvolume of the fuel tank, as specified in paragraph § 86.131-90(a), and may drain the test fuel from other than the lowest point of the tank, as specified in paragraph § 86.131-90(b), provided an equivalent method is used. Equivalency documentation shall be maintained by the manufacturer and shall be made available to the Administrator upon request.

(iii) The manufacturer may perform additional preconditioning on SEA test vehicles other than the preconditioning specified in § 86.132 only if the additional preconditioning had been performed on certification test vehicles of the same configuration.

(iv) The manufacturer shall perform the heat build procedure 11 to 34 hours following vehicle preconditioning rather than according to the time period specified in paragraph § 86.133-90(a). All references in § 86.133 to an evaporative emission enclosure (SHED) and analyzing for HC during the heat build can be ignored.

(v) The manufacturer may substitute slave tires for the drive wheel tires on the vehicle as specified in paragraph § 86.135-90(e): Provided, that the slave tires are the same size.

(vi) The cold start exhaust emission test described in § 86.137 shall follow the heat build procedure described in § 86.133 by not more than one hour.

(vii) In performing exhaust sample analysis under § 86.140.

(A) When testing diesel vehicles, or methanol-fueled Otto-cycle vehicles, the manufacturer shall allow a minimum of 20 minutes warm-up for the HC analyzer, and for diesel vehicles, a minimum of two hours warm-up for the CO, CO_2, and NOx analyzers. (Power is normally left on infrared and chemiluminescent analyzers. When not in use, the chopper motors of the infrared analyzers are turned off and the phototube high voltage supply to the chemiluminescent analyzers is placed in the standby position.)

(B) The manufacturer shall exercise care to prevent moisture from condensing in the sample collection bags.

(viii) The manufacturer need not comply with § 86.142, since the records required therein are provided under other provisions of Subpart G of this part.

(ix) In addition to the requirements of Subpart B of this part, the manufacturer shall prepare gasoline-fueled and methanol-fueled vehicles as follows prior to exhaust emissions testing:

(A) The manufacturer shall inspect the fuel system to insure the absence of any leaks of liquid or vapor to the atmosphere by applying a pressure of 14.5±0.5 inches of water to the fuel system, allowing the pressure to stabilize, and isolating the fuel system from the pressure source, pressure must not drop more than 2.0 inches of water in 5 minutes. If required, the manufacturer shall perform corrective action in accordance with § 86.608 and report this action in accordance with § 86.609.

(B) When performing this pressure check, the manufacturer shall exercise care to neither purge nor load the evaporative emission control system.

(C) The manufacturer shall not modify the test vehicle's evaporative emission control system by component addition, deletion, or substitution, except to comply with paragraph (a)(2)(ii) of this section if approved in advance by the Administrator.

(b)(1) The manufacturer shall not adjust, repair, prepare, or modify the vehicles selected for testing and shall not perform any emission tests on vehicles selected for testing pursuant to the test order unless this adjustment, repair, preparation, modification, and/or tests are documented in the manufacturer's vehicle assembly and inspection procedures and are actually performed or unless these adjustments and/or tests are required or permitted under this subpart or are approved in advance by the Administrator.

(2) For 1981 and later model years the Administrator may adjust or cause to be adjusted any engine or vehicle parameter which the Administrator has determined to be subject to adjustment for new vehicle compliance testing (e.g., for certification or Selective Enforcement Audit testing) in accordance with § 86.081-22(c)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.081-22(e)(3)(ii), prior to the performance of any tests. However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a lower engine idle speed than will be possible within the physically adjustable range of the idle speed parameter on the vehicle when it has accumulated 4,000 miles, all other parameters being adjusted identically for the purpose of comparison. The Administrator, in making or specifying such adjustments, will consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use light-duty vehicles or light-duty trucks. In determining likelihood, the Administrator will consider factors such as, but not limited to, the effect of the adjustment on vehicle performance characteristics and surveillance information from similar in-use vehicles.

(c) Prior to performing exhaust emission testing on an SEA test vehicle, the manufacturer may accumulate on each vehicle a number of miles equal to the greater of 4,000 miles, or the number of miles the manufacturer accumulated during certification on the emission-data vehicle corresponding to the configuration specified in the test order.

(1) Mileage accumulation must be performed in any manner using good engineering judgement to obtain emission results representative of normal production vehicles. This mileage accumulation must be consistent with the new vehicle break-in instructions contained in the applicable vehicle owner's manual, if any.

(2) The manufacturer shall accumulate mileage at a minimum rate of 300 miles per vehicle during each 24 hour period, unless otherwise provided by the Administrator.

(i) The first 24 hour period for mileage accumulation shall begin as soon as authorized vehicle checks, inspections and preparations are completed on each vehicle.

(ii) The minimum mileage accumulation rate does not apply on weekends or holidays.

(iii) If the manufacturer's mileage accumulation target is less than the minimum rate specified (300 miles per day), then the minimum daily accumulation rate shall be equal to the manufacturer's mileage accumulation target.

(3) Mileage accumulation shall be completed on a sufficient number of test vehicles during consecutive 24 hour periods to assure that the number of vehicles tested per day fulfills the requirements of paragraph (g) of this section.

(d) The manufacturer shall not perform any maintenance on test vehicles after selection for testing nor shall the Administrator allow deletion of any test vehicle from the test sequence, unless requested by the manufacturer and approved by the Administrator before any test vehicle maintenance or deletion.

(e) The manufacturer will be allowed 24 hours to ship test vehicles from the assembly plant or storage facility to the test facility if the test facility is not located at the plant or storage facility or in close proximity to the plant or storage facility: Except, That the Administrator may approve more time based upon a request by the manufacturer accompanied by a satisfactory justification.

(f) If a vehicle cannot complete the mileage accumulation or emission tests because of vehicle malfunction, the manufacturer may request the Administrator to authorize the repair of that vehicle or its deletion from the test sequence.

(g) Whenever the manufacturer conducts testing pursuant to a test order issued under this subpart, the manufacturer shall notify the Administrator within one working day of receipt of the test order, which test facility will be used to comply with the test cells at that facility. If no test cells are available at the desired facility, the manufacturer must provide alternate testing capability satisfactory to the Administrator. The manufacturer shall complete emission testing on a minimum of four vehicles per 24 hour period including voided tests for each available test cell at his testing facility: Except, That the Administrator may approve a longer period based upon a request by the manufacturer accompanied by satisfactory justification.

(h) The manufacturer shall perform test vehicle selection, preparation, mileage accumulation, shipping, and testing in such a manner as to assure that the audit is performed in an expeditious manner.

(i) The manufacturer may retest any test vehicle after a fail decision has been reached in accordance with paragraph (d) of § 86.610 based on the first test on each vehicle; except, that the Administrator may approve retesting at other times during the audit based upon a request by the manufacturer accompanied by a satisfactory justification. The manufacturer may test each vehicle the same number of times. The manufacturer may accumulate additional mileage on test vehicles before conducting retests, subject to the provisions of paragraph (c) of this section.

[54 FR 14557, Apr. 11, 1989]

§ 86.609-84 Calculation and reporting of test results.

(a) Initial test results are calculated following the Federal Test Procedure specified in paragraph (a) of § 86.608. Round the initial test results, in accordance with ASTM E 29-67, to the number of decimal places contained in the applicable emission standard expressed to one additional significant figure.

(b) Final test results for each test vehicle shall be calculated by summing the initial test results derived in § 86.609(a) above for each test vehicle, dividing by the number of tests conducted on the vehicle, and rounding, in accordance with ASTM E 29-67, to the same number of decimal places to the right of the decimal point as the initial test results.

(c) The final deteriorated test results for each test vehicle shall be calculated by multiplying the final test results by the appropriate deterioration factor derived from the certification process for the engine family and model year to which the selected configuration belongs and rounded in accordance with ASTM E 29-67 to two significant figures. For the purpose of this paragraph, if a deterioration factor as computed during the certification process is less than one, that deterioration factor shall be one.

(d) Within five working days after completion of testing of all vehicles pursuant to a test order, the manufacturer shall submit to the Administrator a report which includes the following information:

(1) The location and description of the manufacturer's exhaust emission test facilities which were utilized to conduct testing reported pursuant to this section;

(2) The applicable standards against which the vehicles were tested;

(3) Deterioration factors for the selected configuration.

(4) A description of the vehicle selection method used;

(5) For each test conducted,

(i) Test vehicle description including:

(A) Configuration and engine family identification.

(B) Year, make, build date, and model of vehicle.

(C) Vehicle Identification Number.

(D) Miles accumulated on vehicle.

(ii) Location where mileage accumulation was conducted and description of accumulation schedule.

(iii) Test number, date, initial test results, final results and final deteriorated test results for all valid and invalid exhaust emission tests, and the reason for invalidation.

(iv) A complete description of any modification, repair, preparation, maintenance and/or testing which was performed on the test vehicle and (A) has not been reported pursuant to any other paragraph of this subpart and (B) will not be performed on all other production vehicles.

(v) Carbon dioxide emission values for all valid and invalid exhaust emission tests;

(vi) Where a vehicle was deleted from the test sequence by authorization of the Administrator, the reason for the deletion;

(vii) Any other information the Administrator may request relevant to the determination as to whether the new motor vehicles being manufactured by the manufacturer do in fact conform with the regulations with respect to which the certificate of conformity was issued.

(6) The following statement and endorsement:

> This report is submitted pursuant to sections 206 and 208 of the Clean Air Act. This Selective Enforcement Audit was conducted in complete conformance with all applicable regulations under 40 CFR Part 86 et seq. and the conditions of the test order. No emission related change(s) to production processes or quality control procedures for the vehicle configuration tested have been made between receipt of this test order and conclusion of the audit. All data and information reported herein is, to the best of
>
> ______________________________
>
> (Company Name)
>
> knowledge, true and accurate. I am aware of the penalties associated with violations of the Clean Air Act and the regulations thereunder.
>
> ______________________________
>
> (Authorized Company Representative)

(Approved by the Office of Management and Budget under the control number 2060-0064)

[41 FR 31483, July 28, 1976, as amended at 43 FR 4552, Feb. 2, 1978; 49 FR 48483, Dec.

12, 1984; 51 FR 24611, July 7, 1986. Redesignated at 54 FR 2123, Jan. 19, 1989]

§ 86.610–84 Compliance with acceptable quality level and passing and failing criteria for Selective Enforcement Audits.

(a) The prescribed acceptable quality level is 40 percent.

(b) A failed vehicle is one whose final deteriorated test results pursuant to paragraph (c) of § 86.609, for one or more of the applicable exhaust pollutants, exceed the applicable emission standard.

(c) The manufacturer shall test vehicles comprising the test sample until a pass decision is reached for all pollutants or a fail decision is reached for one pollutant. A pass decision is reached when the cumulative number of failed vehicles, as defined in paragraph (b) of this section, for each pollutant is less than or equal to the pass decision number appropriate to the cumulative number of vehicles tested. A fail decision is reached when the cumulative number of failed vehicles for one pollutant is greater than or equal to the fail decision number appropriate to the cumulative number of vehicles tested. The pass and fail decision numbers associated with the cumulative number of vehicles tested are determined by use of the Tables in Appendix XI of this part appropriate for the annual projected sales as made by the manufacturer in its report submitted under paragraph (a)(2) of § 600.207–80 of the Automobile Fuel Economy Regulations. In the Tables in Appendix XI, sampling plan "stage" refers to the cumulative number of vehicles tested. Once a pass decision has been made for a particular pollutant, the number of vehicles whose final deteriorated test results exceed the emission standard for that pollutant shall not be considered any further for purposes of the audit.

(d) Passing or failing of an SEA audit occurs when the decision is made on the last vehicle required to make a decision under paragraph (c) of this section.

(e) The Administrator may terminate testing earlier than required in paragraph (c) of this section.

[49 FR 48483, Dec. 12, 1984. Redesignated at 54 FR 2123, Jan. 19, 1989]

§ 86.612–84 Suspension and revocation of certificates of conformity.

(a) The certificate of conformity is suspended with respect to any vehicle failing pursuant to paragraph (b) of § 86.610 effective from the time that testing of that vehicle is completed.

(b) The Administrator may suspend the certificate of conformity for a configuration which does not pass a Selective Enforcement Audit pursuant to paragraph § 86.610(c) based on the first test, or all tests, conducted on each vehicle. This suspension will not occur before ten days after failure to pass the audit.

(c) If the results of vehicle testing pursuant to these regulations indicate the vehicles of a particular configuration produced at more than one plant do not conform to the regulations with respect to which the certificate of conformity was issued, the Administrator may suspend the certificate of conformity with respect to that configuration for vehicles manufactured by the manufacturer in other plants of the manufacturer.

(d) The Administrator will notify the manufacturer in writing of any suspension or revocation of a certificate of conformity in whole or in part: *Except*, That the certificate of conformity is immediately suspended with respect to any vehicle failing pursuant to § 86.610(a) and as provided for in paragraph (a) of this section.

(e) The Administrator may revoke a certificate of conformity for a configuration when the certificate has been suspended pursuant to paragraph (b) or (c) of this section if the proposed remedy for the nonconformity, as reported by the manufacturer to the Administrator, is one requiring a design change(s) to the engine and/or emission control system as described in the Application for Certification of the affected configuration.

(f) Once a certificate has been suspended for a failed vehicle as provided for in paragraph (a) of this section, the manufacturer must take the following actions:

(1) Before the certificate is reinstated for that failed vehicle,

(i) Remedy the nonconformity, and

(ii) Demonstrate that the vehicle's final deteriorated test results conform to the applicable emission standards or family particulate emission limits, as defined in Part 86 by retesting the vehicle in accordance with these regulations.

(2) Submit a written report to the Administrator within thirty days after successful completion of testing on the failed vehicle, which contains a description of the remedy and test results for the vehicle in addition to other information that may be required by this regulation.

(g) Once a certificate has been suspended pursuant to paragraph (b) or (c) of this section, the manufacturer must take the following actions before the Administrator will consider reinstating such certificate:

(1) Submit a written report to the Administrator which identifies the reason for the noncompliance of the vehicles, describes the proposed remedy, including a description of any proposed quality control and/or quality assurance measures to be taken by the manufacturer to prevent the future occurrence of the problem, and states the date on which the remedies will be implemented, and

(2) Demonstrate that the vehicle configuration for which the certificate of conformity has been suspended does in fact comply with these regulations by testing vehicles selected from normal production runs of that vehicle configuration, at the plant(s) or the facilities specified by the Administrator, in accordance with the conditions specified in the initial test order; *except*, that if the Administrator has not revoked the certificate pursuant to paragraph (e) of this section and if the manufacturer elects to continue testing individual vehicles after suspension of a certificate, the certificate is reinstated for any vehicle actually determined to have its final deteriorated test results in conformance with the applicable standards through testing in accordance with the applicable test procedures.

(h) Once a certificate for a failed configuration has been revoked under paragraph (e) of this section and the manufacturer desires to introduce into commerce a modified version of that configuration, the following actions will be taken before the Administrator may issue a certificate for the new configuration:

(1) If the Administrator determines that the proposed change(s) in vehicle design may have an effect on emission performance deterioration and/or fuel economy, he shall notify the manufacturer within 5 working days after receipt of the report in paragraph (g) of this section whether subsequent testing under this subpart will be sufficient to evaluate the proposed change(s) or whether additional testing will be required; and

(2) After implementing the change(s) intended to remedy the nonconformity, the manufacturer shall demonstrate that the modified vehicle configuration does in fact conform with these regulations by testing vehicles selected from normal production runs of that modified vehicle configuration in accordance with the conditions specified in the initial test order. The Administrator shall consider this testing to satisfy the testing requirements of § 86.079-32 or § 86.079-33 if the Administrator had so notified the manufacturer. If the subsequent testing results in passing of the audit, the Administrator shall reissue or amend the certificate, if necessary, to include that configuration: *Provided*, That the manufacturer has satisfied the testing requirements specified in paragraph (h)(1) of this section. If the subsequent audit is failed, the revocation remains in effect. Any design change approvals under this subpart are limited to the modification of the configuration specified by the test order.

(i) A manufacturer may at any time subsequent to an initial suspension of a certificate of conformity with respect to a test vehicle pursuant to paragraph (a) of this section, but not later than fifteen (15) days or such other period as may be allowed by the Administrator after notification of the Administrator's decision to suspend or revoke a certificate of conformity in whole or in part pursuant to paragraph (b), (c) or (e) of this section, request that the Administrator grant such manufacturer a hearing as to whether the tests have been properly conducted or any sampling methods have been properly applied.

(j) After the Administrator suspends or revokes a certificate of conformity pursuant to this section or notifies a manufacturer of his intent to suspend, revoke or void a certificate of conformity under paragraph (d) of § 86.084-30, and prior to the commencement of a hearing under § 86.614, if the manufacturer demonstrates to the Administrator's satisfaction that the decision to suspend, revoke or void the certificate was based on erroneous information, the Administrator shall reinstate the certificate.

(k) To permit a manufacturer to avoid storing non-test vehicles when conducting an audit of a configuration subsequent to suspension or revocation of the certificate of conformity for that configuration, resulting from failure of the initial audit of that configuration, he may request that the Administrator conditionally reinstate the certificate for that configuration. The Administrator may reinstate the certificate subject to the condition that the manufacturer consents to recall all vehicles of that configuration produced from the time the certificate is conditionally reinstated if the configuration fails the subsequent audit and to remedy any nonconformity at no expense to the owner.

(Approved by the Office of Management and Budget under the control number 2060-0064)

[41 FR 31483, July 28, 1976, as amended at 43 FR 4553, Feb. 2, 1978; 49 FR 48484, Dec. 12, 1984. Redesignated at 54 FR 2123, Jan. 19, 1989]

§ 86.614-84 Hearings on suspension, revocation, and voiding of certificates of conformity.

(a) *Applicability.* The procedures prescribed by this section apply whenever a manufacturer requests a hearing under § 86.084-30(d)(6)(i), § 86.084-30(d)(7), or § 86.612(i).

(b) *Definitions.* The following definitions shall be applicable to this section:

(1) "Hearing Clerk" shall mean the Hearing Clerk of the Environmental Protection Agency.

(2) "Manufacturer" refers to a manufacturer contesting a suspension or revocation order directed at the manufacturer.

(3) "Party" shall include the Agency and the manufacturer.

(4) "Presiding Officer" shall mean an Administrative Law Judge appointed pursuant to 5 U.S.C. 3105 (see also 5 CFR Part 930 as amended).

(5) "Judicial Officer" shall mean an officer or employee of the Agency appointed as a Judicial Officer by the Administrator pursuant to this section who shall meet the qualifications and perform functions as follows:

(i) Officer—there may be designated for the purposes of this section one or more Judicial Officers. As work requires, there may be a Judicial Officer designated to act for the purposes of a particular case.

(ii) Qualifications—A Judicial Officer may be a permanent or temporary employee of the Agency who performs other duties for the Agency. Such Judicial Officer shall not be employed by the Office of Enforcement or have any connection with the preparation or presentation of evidence for a hearing held pursuant to this subpart.

(iii) Functions—the Administrator may consult with a Judicial Officer or delegate all or part of his authority to act in a given case under this section to a Judicial Officer: *Provided*, That this delegation shall not preclude the Judicial Officer from referring any motion or case to the Administrator when the Judicial Officer determines such referral to be appropriate.

(c) *Request for public hearing.* (1) If the manufacturer disagrees with the Administrator's decision to suspend revoke, or void a certificate or disputes the basis for an automatic suspension under § 86.612(a), it may request a public hearing as described in this section. Requests for such a hearing shall be filed with the Administrator not later than 15 days after the Administrator's notification of his decision to suspend or revoke unless otherwise specified by the Administrator. Two copies of such request shall simultaneously be served upon the Director of the Manufacturers Operations Division and two copies filed with the Hearing Clerk. Failure of the manufacturer to request a hearing within the time provided shall constitute a waiver of his right to such a hearing. Subsequent to the expiration of the period for requesting a hearing as of right, the Administrator may, in his discretion and for good cause shown, grant the manufacturer a hearing to contest the suspension or revocation.

(2) The request for a public hearing shall contain:

(i) A statement as to which vehicle configurations or engine families are to be the subject of the hearing;

(ii) A concise statement of the issues to be raised by the manufacturer at the hearing for each vehicle configuration or engine family or vehicle for which the manufacturer has requested the hearing: *Provided, however,* That in the case of a hearing request under paragraph § 86.612(i), the hearing is restricted to the following issues:

(A) Whether tests were conducted in accordance with applicable regulations under this part;

(B) Whether test equipment was properly calibrated and functioning;

(C) Whether sampling procedures specified in Appendix XI of this part were followed; and

(D) Whether there exists a basis for distinguishing vehicles produced at plants other than the one from which vehicles were selected which would invalidate the Administrator's decision under § 86.612(c);

(iii) A statement specifying reasons the manufacturer believes he will prevail on the merits on each of the issues so raised; and

(iv) A summary of the evidence which supports the manufacturer's position on each of the issues so raised.

(3) A copy of all requests for public hearings shall be kept on file in the Office of the Hearing Clerk and shall be made available to the public during Agency business hours.

(d) *Summary decision.* (1) In the case of a hearing requested under § 86.612(i), when it clearly appears from the data and other information contained in the request for a hearing that there is no genuine and substantial question of fact with respect to the issues specified in § 86.614(c)(2)(ii), the Administrator shall enter an order denying the request for a hearing. In addition, if the original decision to suspend or revoke a certificate of conformity was made under § 86.612(d) prior to the decision to deny the request for a hearing, the order denying the request will reaffirm the suspension or revocation.

(2) In the case of a hearing requested under § 86.084-30(d)(6)(i), to challenge a proposed suspension of a certificate of conformity for the reasons specified in § 86.084-30(d)(1) (i) or (ii), when it clearly appears from the data and other information contained in the request for a hearing that there is no genuine and substantial question of fact with respect to the issue of whether the refusal to comply with the provisions of a test order or any other requirement of § 86.603 was caused by conditions and circumstances outside the control of the manufacturer, the Administrator will enter an order denying the request for a hearing, and suspending the certificate of conformity.

(3) Any order issued under paragraph (d) (1) or (2) of this section shall have the force and effect of a final decision of the Administrator, as issued pursuant to paragraph (w)(4) of this section.

(4) If the Administrator determines that a genuine and substantial question of fact does exist with respect to any of the issues referred to in paragraphs (d)(1) and (2) of this section, he shall grant the request for a hearing and publish a notice of public hearing in accordance with paragraph (h) of this section.

(e) *Filing and service.* (1) An original and two copies of all documents or papers required or permitted to be filed pursuant to this section shall be filed with the Hearing Clerk. Filing shall be deemed timely if mailed, as determined by the postmark, to the Hearing Clerk within the time allowed by this section. If filing is to be accomplished by mailing, the documents shall be sent to the address set forth in the notice of public hearing as described in paragraph (h) of this section.

(2) To the maximum extent possible, testimony shall be presented in written form. Copies of written testimony shall be served upon all parties as soon as practicable prior to the start of the hearing. A certificate of service shall

be provided on or accompany each document or paper filed with the Hearing Clerk. Documents to be served upon the Director of the Manufacturers Operations Division shall be sent by registered mail to: Director, Manufacturers Operations Division, U.S. Environmental Protection Agency (EN-340), 401 M Street, SW., WSM, Washington, D.C. 20460. Service by registered mail is complete upon mailing.

(f) *Time.* (1) In computing any period of time prescribed or allowed by this section, except as otherwise provided, the day of the act or event from which the designated period of time begins to run shall not be included. Saturdays, Sundays, and Federal legal holidays shall be included in computing any such period allowed for the filing of any document or paper, except that when such period expires on a Saturday, Sunday, or Federal legal holiday, such period shall be extended to include the next following business day.

(2) A prescribed period of time within which a party is required or permitted to do an act shall be computed from the time of service, except that when service is accomplished by mail, three days shall be added to the prescribed period.

(g) *Consolidation.* The Administrator or the Presiding Officer in his discretion may consolidate two or more proceedings to be held under this section for the purpose of resolving one or more issues whenever it appears that such consolidation will expedite or simplify consideration of such issues. Consolidation shall not affect the right of any party to raise issues that could have been raised if consolidation had not occurred.

(h) *Notice of public hearings.* (1) Notice of a public hearing under this section shall be given by publication in the FEDERAL REGISTER and by such other means as the Administrator finds appropriate to provide notice to the public. To the extent possible hearings under this section shall be scheduled to commence within 14 days of receipt of the application in paragraph (c) of this section.

(i) *Amicus curiae.* Persons not parties to the proceeding wishing to file briefs may do so by leave of the Presiding Officer granted on motion. A motion for leave shall identify the interest of the applicant and shall state the reasons why the proposed amicus brief is desirable.

(j) *Presiding Officer.* The Presiding Officer shall have the duty to conduct a fair and impartial hearing in accordance with 5 U.S.C. sections 554, 556 and 557 and to take all necessary action to avoid delay in the disposition of the proceedings and to maintain order. He shall have all power consistent with Agency rule and with the Administrative Procedure Act necessary to this end, including the following:

(1) To administer oaths and affirmations;

(2) To rule upon offers of proof and exclude irrelevant or repetitious material;

(3) To regulate the course of the hearings and the conduct of the parties and their counsel therein;

(4) To hold conferences for simplification of the issues or any other proper purpose;

(5) To consider and rule upon all procedural and other motions appropriate in such proceedings;

(6) To require the submission of direct testimony in written form with or without affidavit whenever, in the opinion of the Presiding Officer, oral testimony is not necessary for full and true disclosure of the facts;

(7) To enforce agreements and orders requiring access as authorized by law;

(8) To require the filing of briefs on any matter on which he is required to rule;

(9) To require any party or any witness, during the course of the hearing to state his position on any issue;

(10) To take or cause depositions to be taken whenever the ends of justice would be served thereby;

(11) To make decisions or recommend decisions to resolve the disputed issues on the record of the hearing;

(12) To issue, upon good cause shown, protective orders as described in paragraph (n) of this section.

(k) *Conferences.* (1) At the discretion of the Presiding Officer, conferences may be held prior to or during any hearing. The Presiding Officer shall direct the Hearing Clerk to notify all parties of the time and location of any such conference. At the discretion of the Presiding Officer, persons other than parties may attend. At a conference the Presiding Officer may:

(i) Obtain stipulations and admissions, receive requests and order depositions to be taken, identify disputed issues of fact and law, and require or allow the submission of written testimony from any witness or party;

(ii) Set a hearing schedule for as many of the following as are deemed necessary by the Presiding Officer:

(A) Oral and written statements;

(B) Submission of written direct testimony as required or authorized by the Presiding Officer;

(C) Oral direct and cross-examination of a witness where necessary as prescribed in paragraph (p) of this section: and

(D) Oral argument, if appropriate.

(iii) Identify matters of which official notice may be taken;

(iv) Consider limitation of the number of expert and other witnesses;

(v) Consider the procedure to be followed at the hearing; and

(vi) Consider any other matter that may expedite the hearing or aid in the disposition of the issue.

(2) The results of any conference including all stipulations shall, if not transcribed, be summarized in writing by the Presiding Officer and made part of the record.

(l) *Primary discovery* (exchange of witness lists and documents). (1) At a prehearing conference or within some reasonable time set by the Presiding Officer prior to the hearing, each party shall make available to the other parties the names of the expert and other witnesses the party expects to call, together with a brief summary of their expected testimony and a list of all documents and exhibits which the party expects to introduce into evidence. Thereafter, witnesses, documents, or exhibits may be added and summaries of expected testimony amended upon motion by a party.

(2) The Presiding Officer, may, upon motion by a party or other person, and for good cause shown, by order (i) restrict or defer disclosure by a party of the name of a witness or a narrative summary of the expected testimony of a witness, and (ii) prescribe other appropriate measures to protect a witness. Any party affected by any such action shall have an adequate opportunity, once he learns the name of a witness and obtains the narrative summary of his expected testimony, to prepare for the presentation of his case.

(m) *Other discovery.* (1) Except as so provided by paragraph (l) of this section, further discovery, under this paragraph, shall be permitted only upon determination by the Presiding Officer:

(i) That such discovery will not in any way unreasonably delay the proceeding;

(ii) That the information to be obtained is not obtainable voluntarily; and

(iii) That such information has significant probative value. The Presiding Officer shall be guided by the procedures set forth in the Federal Rules of Civil Procedure, where practicable, and the precedents thereunder, except that no discovery shall be undertaken except upon order of the Presiding Officer or upon agreement of the parties.

(2) The Presiding Officer shall order depositions upon oral questions only upon a showing of good cause and upon a finding that:

(i) The information sought cannot be obtained by alternative methods; or

(ii) There is a substantial reason to believe that relevant and probative evidence may otherwise not be preserved for presentation by a witness at the hearing.

(3) Any party to the proceeding desiring an order of discovery shall make a motion or motions therefor. Such a motion shall set forth:

(i) The circumstances warranting the taking of the discovery;

(ii) The nature of the information expected to be discovered; and

(iii) The proposed time and place where it will be taken.

If the Presiding Officer determines the motion should be granted, he shall issue an order for the taking of such discovery together with the conditions and terms thereof.

(4) Failure to comply with an order issued pursuant to this paragraph may

lead to the inference that the information to be discovered would be adverse to the person or party from whom the information was sought.

(n) *Protective orders, in camera proceedings.* (1) Upon motion by a party or by the person from whom discovery is sought, and upon a showing by the movant that the disclosure of the information to be discovered, or a particular part thereof, (other than emission data) would result in methods or processes entitled to protection as trade secrets of such person being divulged, the Presiding Officer may enter a protective order with respect to such material. Any protective order shall contain such terms governing the treatment of the information as may be appropriate under the circumstances to prevent disclosure outside the hearing: *Provided,* That the order shall state that the material shall be filed separately from other evidence and exhibits in the hearing. Disclosure shall be limited to parties to the hearing, their counsel and relevant technical consultants, and authorized representatives of the United States concerned with carrying out the Act. Except in the case of the government, disclosure may be limited to counsel for parties who shall not disclose such information to the parties themselves. Except in the case of the government, disclosure to a party or his counsel shall be conditioned on execution of a sworn statement that no disclosure of the information will be made to persons not entitled to receive it under the terms of the protective order. (No such provision is necessary where government employees are concerned because disclosure by them is subject to the terms of 18 U.S.C. 1905.)

(2)(i) A party or person seeking a protective order may be permitted to make all or part of the required showing in camera. A record shall be made of such in camera proceedings. If the Presiding Officer enters a protective order following a showing in camera, the record of such showing shall be sealed and preserved and made available to the agency or court in the event of appeal.

(ii) Attendance at any in camera proceeding may be limited to the Presiding Officer, the agency, and the person or party seeking the protective order.

(3) Any party, subject to the terms and conditions of any protective order issued pursuant to paragraph (n)(1) of this section, desiring for the presentation of his case to make use of any in camera documents or testimony shall make application to the Presiding Officer by motion setting forth the justification therefor. The Presiding Officer, in granting any such motion, shall enter an order protecting the rights of the affected persons and parties and preventing unnecessary disclosure of such information, including the presentation of such information and oral testimony and cross-examination concerning it in executive session, as in his discretion is necessary and practicable.

(4) In the submittal of proposed findings, briefs, or other papers, counsel for all parties shall make a good faith attempt to refrain from disclosing the specific details of in camera documents and testimony. This shall not preclude references in such proposed findings, briefs, or other papers to such documents or testimony including generalized statements based on their contents. To the extent that counsel considers it necessary to include specific details in their presentations, such data shall be incorporated in separate proposed findings, briefs, or other papers marked "confidential," which shall become part of the in camera record.

(o) *Motions.* (1) All motions, except those made orally during the course of the hearing, shall be in writing and shall state with particularity the grounds therefore, shall set forth the relief or order sought, and shall be filed with the Hearing Clerk and served upon all parties.

(2) Within such time as may be fixed by the Administrator, the judicial officer, or the Presiding Officer, as appropriate, any party may serve and file an answer to the motion. The movant shall, if requested by the Administrator, the judicial officer, or the Presiding Officer, as appropriate, serve and file reply papers, within the time set by the request.

(3) The Presiding Officer shall rule upon all motions filed or made prior to

the filing of his decision or accelerated decision, as appropriate. The Administrator or the judicial officer, as appropriate, shall rule upon all motions filed prior to the appointment of a Presiding Officer and all motions filed after the filing of the decision of the Presiding Officer or accelerated decision. Oral argument of motions will be permitted only if the Presiding Officer, the Administrator or the judicial officer, as appropriate, deems it necessary.

(p) *Evidence.* (1) The official transcripts and exhibits, together with all papers and requests filed in the proceeding, shall constitute the record. Immaterial or irrelevant parts of an admissible document shall be segregated and excluded so far as practicable. Documents or parts thereof subject to a protective order under paragraph (n) of this section shall be segregated. Evidence may be received at the hearing even though inadmissible under the rules of evidence applicable to judicial proceedings. The weight to be given evidence shall be determined by its reliability and probative value.

(2) The Presiding Officer shall allow the parties to examine and cross-examine a witness to the extent that such examination and cross-examination is necessary for a full and true disclosure of the facts.

(3) Rulings of the Presiding Officer on the admissibility of evidence, the propriety of examination and cross-examination and other procedural matters shall appear in the record.

(4) Parties shall automatically be presumed to have taken exception to an adverse ruling.

(q) *Record.* (1) Hearings shall be stenographically reported and transcribed and the original transcripts shall be part of the record and the sole official transcript. Copies of the record shall be filed with the Hearing Clerk and made available during Agency business hours for public inspection. Any person desiring a copy of the record of the hearing or any part thereof, except as provided in paragraph (n) of this section, shall be entitled to the same upon payment of the cost thereof.

(2) The official transcripts and exhibits, together with all papers and requests filed in the proceeding, shall constitute the record.

(r) *Proposed findings, conclusions.* (1) Within 4 days of the close of the reception of evidence, or within such longer time as may be fixed by the Presiding Officer, any party may submit for the consideration of the Presiding Officer proposed findings of fact, conclusions of law, and a proposed order, together with reasons therefor and briefs in support thereof. Such proposals shall be in writing, shall be served upon all parties, and shall contain adequate references to the record and authorities relied upon.

(2) The record shall show the Presiding Officer's ruling on the proposed findings and conclusions except when his order disposing of the proceeding otherwise informs the parties of the action taken by him thereon.

(s) *Decision of the Presiding Officer.* (1) Unless extended by the Administrator, the Presiding Officer shall issue and file with the Hearing Clerk his decision within 14 days (or within 7 days in the case of a hearing requested under § 86.612(i)) after the period for filing proposed findings as provided for in paragraph (r) of this section has expired.

(2) The Presiding Officer's decision shall become the decision of the Administrator (i) when no notice of intention to appeal as described in paragraphs (t) and (u) of this section is filed, 10 days after issuance thereof, unless in the interim the Administrator shall have taken action to review or stay the effective date of the decision; or (ii) when a notice of intention to appeal is filed but the appeal is not perfected as required by paragraph (t) or (u) of this section, 5 days after the period allowed for perfection of an appeal has expired unless within that 5 day period, the Administrator shall have taken action to review or stay the effective date of the decision;

(3) The Presiding Officer's decision shall include a statement of findings and conclusions, as well as the reasons or basis therefore, upon all the material issues of fact or law presented on the record and an appropriate rule or order. Such decision shall be supported by substantial evidence and based

upon a consideration of the whole record.

(4) At any time prior to the issuance of his decision, the Presiding Officer may reopen the proceeding for the reception of further evidence. Except for the correction of clerical errors, the jurisdication of the Presiding Officer is terminated upon the issuance of his decision.

(t) *Appeal from the decision of the Presiding Officer.* (1) Any party to a proceeding may appeal the Presiding Officer's decision to the Administrator: *Provided,* That within 10 days after issuance of the Presiding Officer's decision such party files a notice of intention to appeal and an appeal brief within 20 days of such decision.

(2) When an appeal is taken from the decision of the Presiding Officer, any party may file a brief with respect to such appeal. The brief shall be filed within 15 days of the date of the filing of the appellant's brief.

(3) Any brief filed pursuant to this paragraph shall contain in the order indicated, the following:

(i) A subject index of the matter in the brief, with page references, and a table of cases (alphabetically arranged) textbooks, statutes, and other material cited, with page references thereto;

(ii) A specification of the issues intended to be urged: *Provided, however,* That in the case of a hearing requested under § 86.612(i), the brief shall be restricted to the issues specified in paragraph (c)(2)(ii) of this section;

(iii) The argument presenting clearly the points of fact and law relied upon in support of the position taken on each issue, with specific page references to the record and the legal or other material relied upon; and

(iv) A proposed order for the Administrator's consideration if different from the order contained in the Presiding Officer's decision.

(4) No brief in excess of 40 pages shall be filed without leave of the Administrator.

(5) Oral argument will be allowed only in the discretion of the Administrator.

(u) *Summary appeal.* (1) In the case of a hearing requested under § 86.612(i), any appeal taken from the decision of the Presiding Officer shall be conducted under this paragraph.

(2) Any party to the proceeding may appeal the Presiding Officer's decision to the Administrator by filing a notice of appeal within 10 days.

(3) The notice appeal shall be in the form of a brief, and shall conform to the requirements of paragraph (t)(3) of this section.

(4) Within 10 days after a notice of appeal from the decision of the Presiding Officer is filed under this paragraph, any party may file a brief with respect to such appeal.

(5) No brief in excess of 15 pages shall be filed without leave of the Administrator.

(v) *Review of the Presiding Officer's decision in absence of appeal.* (1) If after the expiration of the period for taking an appeal as provided for by paragraphs (t) or (u) of this section, no notice of intention to appeal the decision of the Presiding Officer has been filed, or if filed, not perfected, the Hearing Clerk shall so notify the Administrator.

(2) The Administrator, upon receipt of notice from the Hearing Clerk that no notice of intention to appeal has been filed, or if filed, not perfected pursuant to paragraphs (t) or (u) of this section, may, on his own motion, within the time limits specified in paragraph (s)(2) of this section, review the decision of the Presiding Officer. Notice of the intention of the Administrator to review the decision of the Presiding Officer shall be given to all parties and shall set forth the scope of such review and the issues which shall be considered and shall make provision for filing of briefs.

(w) *Decision of appeal or review.* (1) Upon appeal from or review of the Presiding Officer's decision, the Administrator shall consider such parts of the record as are cited or as may be necessary to resolve the issues presented and in addition shall, to the extent necessary or desirable, exercise all the powers which he could have exercised if he had presided at the hearing.

(2) In rendering his decision, the Administrator shall adopt, modify or set aside the findings, conclusions, and order contained in the decision of the Presiding Officer and shall set forth in

his decision a statement of the reasons or bases for his action.

(3) In those cases where the Administrator believes that he should have further information or additional views of the parties as to the form and content of the rule or order to be issued, the Administrator, in his discretion, may withhold final action pending the receipt of such additional information or views, or may remand the case to the Presiding Officer.

(4) Any decision rendered under this paragraph which completes disposition of a case shall be a final decision of the Administrator.

(x) *Reconsideration.* Within twenty (20) days after issuance of the Administrator's decision, any party may file with the Administrator a petition for reconsideration of such decision, setting forth the relief desired and the grounds in support thereof. Any petition filed under this subsection must be confined to new questions raised by the decision or final order and upon which the petitioner had no opportunity to argue before the Presiding Officer or the Administrator: *Provided, however,* That in the case of a hearing requested under § 86.612(i) such new questions shall be limited to the issues specified in paragraph (c)(2)(ii) of this section. Any party desiring to oppose such a petition shall file an answer thereto within ten (10) days after the filing of the petition. The filing of a petition for reconsideration shall not operate to stay the effective date of the decision or order or to toll the running of any statutory time period affecting such decision or order unless specifically so ordered by the Administrator.

(y) *Accelerated decision, dismissal.* (1) The Presiding Officer, upon motion of any party or sua sponte, may at any time render an accelerated decision in favor of the Agency or the manufacturer as to all or any part of the proceeding, without further hearing or upon such limited additional evidence such as affidavits as he may require, or dismiss any party with prejudice, for any of the following reasons:

(i) Failure to state a claim upon which relief can be granted, or direct or collateral estoppel;

(ii) The lack of any genuine issue of material fact, causing a party to be entitled to judgment as a matter of law; or

(iii) Such other and further reasons as are just, including specifically failure to obey a procedural order of the Presiding Officer.

(2) If under this paragraph an accelerated decision is issued as to all the issues and claims joined in the proceeding, the decision shall be treated for the purposes of these procedures as the decision of the Presiding Officer as provided in paragraph (s) of this section.

(3) If under this paragraph, judgment is rendered on less than all issues or claims in the proceeding, the Presiding Officer shall determine what material facts exist without substantial controversy and what material facts are actually and in good faith controverted. He shall thereupon issue an order specifying the facts which appear without substantial controversy, and the issues and claims upon which the hearing will proceed.

(z) *Conclusion of hearing.* (1) If, after the expiration of the period for taking an appeal as provided for by paragraphs (t) and (u) of this section, no appeal has been taken from the Presiding Officer's decision, and after the expiration of the period for review by the Administrator on his own motion as provided for by paragraph (v) of this section, the Administrator does not move to review such decision, the hearing will be deemed to have ended at the expiration of all periods allowed for such appeal and review.

(2) If an appeal of the Presiding Officer's decision is taken pursuant to paragraphs (t) and (u) of this section, or if, in the absence of such appeal the Administrator moves to review the decision of the Presiding Officer pursuant to paragraph (v) of this section, the hearing will be deemed to have ended upon rendering of a final decision by the Administrator.

(aa) *Judicial review.* (1) The Administrator hereby designates the General Counsel, Environmental Protection Agency as the officer upon whom copy of any petition for judicial review shall be served. Such officer shall be responsible for filing in the court the record on which the order of the Administrator is based.

(2) Before forwarding the record to the court, the Agency shall advise the petitioner of costs of preparing it and as soon as payment to cover fees is made, shall forward the record to the court.

[41 FR 31483, July 28, 1976, as amended at 43 FR 4553, Feb. 2, 1978; 44 FR 61962, Oct. 29, 1979. Redesignated and amended at 49 FR 48484, Dec. 12, 1984, and further redesignated at 54 FR 2123, Jan. 19, 1989]

§ 86.615-84 Treatment of confidential information.

(a) Any manufacturer may assert that some or all of the information submitted pursuant to this subpart is entitled to confidential treatment as provided by 40 CFR Part 2, Subpart B.

(b) Any claim of confidentiality must accompany the information at the time it is submitted to EPA.

(c) To assert that information submitted pursuant to this subpart is confidential, a manufacturer must indicate clearly the items of information claimed confidential by marking, circling, bracketing, stamping, or otherwise specifying the confidential information. Furthermore, EPA requests, but does not require, that the submitter also provide a second copy of its submittal from which all confidential information has been deleted. If a need arises to publicly release nonconfidential information, EPA will assume that the submitter has accurately deleted the confidential information from this second copy.

(d) If a claim is made that some or all of the information submitted pursuant to this subpart is entitled to confidential treatment, the information covered by that confidentiality claim will be disclosed by the Administrator only to the extent and by means of the procedures set forth in Part 2, Subpart B, of this chapter.

(e) Information provided without a claim of confidentiality at the time of submission may be made available to the public by EPA without further notice to the submitter, in accordance with 40 CFR 2.204(c)(2)(i)(A).

[50 FR 34798, Aug. 27, 1985. Redesignated at 54 FR 2123, Jan. 19, 1989]

Subpart H—[Reserved]

Subpart I—Emission Regulations for New Diesel Heavy-Duty Engines; Smoke Exhaust Test Procedure

AUTHORITY: Secs. 202, 206, 207, 208, 301(a), Clean Air Act; as amended 42 U.S.C. 7521, 7524, 7541, 7542, and 7601.

SOURCE: 48 FR 52203, Nov. 16, 1983, unless otherwise noted.

§ 86.884-1 General applicability.

The provisions of this subpart are applicable to new petroleum-fueled diesel heavy-duty engines beginning with the 1984 model year and methanol-fueled diesel heavy-duty engines beginning with the 1990 model year.

[54 FR 14559, Apr. 11, 1989]

§ 86.884-2 Definitions.

The definitions in § 86.084-2 apply to this subpart.

§ 86.884-3 Abbreviations.

The abbreviations in § 86.078-3 apply to this subpart.

§ 86.884-4 Section numbering.

The section numbering system set forth in § 86.084-4(a) applies to this subpart.

§ 86.884-5 Test procedures.

The procedures described in this and subsequent sections will be the test program to determine the conformity of engines with the standards set forth in § 86.084-11(b).

(a) The test consists of a prescribed sequence of engine operating conditions on an engine dynamometer with continuous examination of the exhaust gases. The test is applicable equally to controlled engines equipped with means for preventing, controlling, or eliminating smoke emissions and to uncontrolled engines.

(b) The test is designed to determine the opacity of smoke in exhaust emissions during those engine operating conditions which tend to promote smoke from diesel vehicles.

(c) The test procedure begins with a preconditioned engine which is then run through preloading and preconditioning operations. After an idling period, the engine is operated through acceleration and lugging modes during which smoke emission measurements are made to compare with the standards. The engine is then returned to the idle condition and the acceleration and lugging modes are repeated. Three consecutive sequences of acceleration and lugging constitutes the full set of operating conditions for smoke emission measurement.

(d)(1) Except in cases of component mulfunction or failure, all emission control systems installed on, or incorporated in, a new motor vehicle engine shall be functioning during all procedures in this subpart.

(2) Maintenance to correct component malfunction or failure shall be authorized in accordance with § 86.084-25.

(Approved by the Office of Management and Budget under the control number 2000-0390)

[48 FR 52203, Nov. 16, 1983, as amended at 49 FR 48140, Dec. 10, 1984; 54 FR 14559, Apr. 11, 1989]

§ 86.884-6 Fuel specifications.

The requirements of this section are set forth in § 86.1313.

[54 FR 14559, Apr. 11, 1989]

§ 86.884-7 Dynamometer operation cycle for smoke emission tests.

(a) The following sequence of operations shall be performed during engine dynamometer testing of smoke emissions, starting with the dynamometer preloading determined and the engine preconditioned (§ 86.884-12(c)).

(1) *Idle Mode.* The engine is caused to idle for 5.0 to 5.5 minutes at the manufacturer's recommended curb idle speed. The dynamometer controls shall be set to provide the speed and load necessary to comply with the heavy-duty "curb idle" definition per § 86.084-2, in accordance with predominant engine application.

(2) *Acceleration mode.* (i) The engine speed shall be increased to 200 ±50 rpm above the manufacturer's recommended curb idle speed within three seconds.

(ii) Immediately upon completion of the mode specified in paragraph (a)(2)(i) of this section, the throttle shall be moved rapidly to, and held in, the fully open position. The inertia of the engine and the dynamometer, or alternately a preselected dynamometer load, shall be used to control the acceleration of the engine so that the speed increases to 85 percent of the rated speed in 5 ±1.5 seconds. This acceleration shall be linear within 100 rpm as specified in § 86.884-13(c).

(iii) After the engine reaches the speed required in paragraph (a)(2)(ii) of this section the throttle shall be moved rapidly to, and held in, the fully closed position. Immediately after the throttle is closed, the preselected load required to perform the acceleration in paragraph (a)(2)(iv) of this section shall be applied. For electric motoring dynamometer operation in speed mode, the deceleration shall be performed in 2±1.5 seconds.

(iv) When the engine decelerates to the intermediate speed (within 50 rpm), the throttle shall be moved rapidly to, and held in, the fully open position. The preselected dynamometer load which was applied during the preceding transition period shall be used to control the acceleration of the engine so that the speed increases to at least 95 percent of the rated speed in 10 ±2 seconds.

(v) For electric dynamometer operation in speed mode, motoring assist may be used to offset excessive dynamometer inertia load when necessary. No negative flywheel torque shall occur during any of the three acceleration modes in paragraph (a)(2) of this section except for a maximum of 10ft-lbs. for the first 0.5 second of the mode.

(3) *Lugging mode.* (i) Immediately upon the completion of the preceding acceleration mode, the dynamometer controls shall be adjusted to permit the engine to develop maximum horsepower at rated speed. This transition period shall be 50 to 60 seconds in duration. During the last 10 seconds of this period, the engine speed shall be maintained within 50 rpm of the rated speed, and the power (corrected, if necessary, to rating conditions) shall be no less than 95 percent of the maximum horsepower developed during the

preconditioning prior to the smoke cycle.

(ii) With the throttle remaining in the fully open position, the dynamometer controls shall be adjusted gradually so that the engine speed is reduced to the intermediate speed. This lugging operation shall be performed smoothly over a period of 35±5 seconds. The rate of slowing of the engine shall be linear, within 100 rpm, as specified in § 86.884-13(c).

(4) *Engine unloading.* Immediately upon completion of the preceding lugging mode, the dynamometer and engine controls shall be returned to the idle position described in paragraph (a)(1) of this section. The engine must be at the curb idle condition within one minute after completion of the lugging mode.

(b) The procedures described in paragraphs (a)(1) through (a)(4) of this section shall be repeated until three consecutive valid cycles have been completed. If three valid cycles have not been completed after a total of six consecutive cycles have been run, the engine shall be preconditioned by operation at maximum horsepower at rated speed for 10 minutes before the test sequence is repeated.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52203, Nov. 16, 1983, as amended at 49 FR 48141, Dec. 10, 1984; 52 FR 47870, Dec. 16, 1987]

§ 86.884-8 Dynamometer and engine equipment.

The following equipment shall be used for smoke emission testing of engines on engine dynamometers:

(a) An engine dynamometer with adequate characteristics to perform the test cycle described in §86.884-7.

(b) An engine cooling system having sufficient capacity to maintain the engine at normal operating temperatures during conduct of the prescribed engine tests.

(c) An exhaust system whose end is 15 ±5 feet from the exhaust manifold (or the crossover junction in the case of Vee engines). The exhaust system can share the same hardware required in Part 86 Subpart N, § 86.1327-84(f)(2), insofar as that hardware also meets the following smoke test requirements. The smoke exhaust system shall present an exhaust backpressure within ±0.2 inch Hg of the upper limit at maximum rated horsepower, as established by the engine manufacturer in his sales and service literature for vehicle application. The terminal two feet of the exhaust pipe used for smoke measurement shall be of circular cross section and be free of elbows and bends. The end of the pipe shall be cut off squarely. The terminal two feet of the exhaust pipe shall have a nominal inside diameter in accordance with the engine being tested, as specified below:

Maximum-rated horsepower	Exhaust pipe diameter (inches)
Less than 101	2
101 to 200	3
201 to 300	4
301 or more	5

(d) An engine air inlet system presenting an air inlet restriction within one inch of water of the upper limit for the engine operating condition which results in maximum air flow, as established by the engine manufacturer in his sales and service literature, for the engine being tested.

§ 86.884-9 Smoke measurement system.

(a) *Schematic drawing.* The Figure I84-1 is a schematic drawing of the optical system of the light extinction meter.

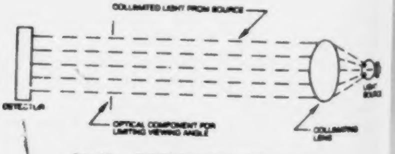

COLLIMATED LIGHT FROM SOURCE
DETECTOR
OPTICAL COMPONENT FOR LIMITING VIEWING ANGLE
COLLIMATING LENS
LIGHT BULB

Figure 84-1 SMOKEMETER OPTICAL SYSTEM (SCHEMATIC)

(b) *Equipment.* The following equipment shall be used in the system.

(1) Adapter—the smokemeter optical unit may be mounted on a fixed or movable frame. The normal unre-

stricted shape of the exhaust plume shall not be modified by the adaptor, the meter, or any ventilatory system used to remove the exhaust from the test site.

(2) Smokemeter (light extinction meter)—continuous recording, full-flow light obscuration meter.

(i) It is positioned near the end of the exhaust pipe so that a built-in light beam traverses the exhaust smoke plume which issues from the pipe at right angles to the axis of the plume.

(ii) The light source is an incandescent lamp operating at a constant voltage of not less than 15 percent of the manufacturer's specified voltage.

(iii) The lamp output is collimated to a beam with a nominal diameter of 1.125 inches and an angle of divergence within a 4° included angle.

(iv) A light detector directly opposed to the light source measures the amount of light blocked by the smoke in the exhaust. The detector sensitivity is restricted to the visual range and comparable to that of the human eye.

(v) A collimating tube with apertures equal to the beam diameter is attached to the detector to restrict the viewing angle of the detector to within a 16° included angle.

(vi) An amplified signal corresponding to the amount of light blocked is recorded continuously on a remote recorder.

(vii) An air curtain across the light source and detector window assemblies may be used to minimize deposition of smoke particles on those surfaces provided that it does not measurably affect the opacity of the plume.

(viii) The smokemeter consists of two units; an optical unit and a remote control unit.

(ix) Light extinction meters employing substantially identical measurement principles and producing substantially equivalent results, but which employ other electronic and optical techniques, may be used only after having been approved in advance by the Administrator.

(3) Recorder—a continuous recorder, with variable chart speed over a minimal range of 0.5 to 8.0 inches per minute (or equivalent) and an automatic marker indicating 1-second intervals continuously records the exhaust gas opacity, engine rpm and throttle position.

(i) The recorder is equipped to indicate only when the throttle is in the fully open or fully closed position.

(ii) The recorder scale for opacity is linear and calibrated to read from 0 to 100 percent opacity full scale.

(iii) The opacity trace has a resolution within one percent opacity.

(iv) The recorder scale for engine rpm is linear and has a resolution of 30 rpm.

(v) The throttle position trace clearly indicates when the throttle is in the fully open and fully closed positions.

(vi) Any means other than a strip-chart recorder may be used provided it produces a permanent visual data record of quality equal to or better than that described above (e.g., tabulated data, traces, or plots).

(4) The recorder used with the smokemeter shall be capable of full-scale deflection in 0.5 second or less. The smokemeter-recorder combination may be damped so that signals with a frequency higher than 10 cycles per second are attenuated. A separate low-pass electronic filter with the following performance characteristics may be installed between the smokemeter and the recorder to achieve the high-frequency attenuation:

(i) Three decibel point—10 cycles per second.

(ii) Insertion loss—zero ±0.5 decibel.

(iii) Selectivity—12 decibels per octave above 10 cycles per second.

(iv) Attenuation—27 decibels down at 40 cycles per second minimum.

(5) In lieu of the use of chart recorders, automatic data collection equipment may be used to record all required data. Automatic data processing equipment may then be used to perform the data analysis specified in § 86.884-13. The automatic data collection equipment must be capable of sampling at least two records per second.

(c) *Assembling equipment.* (1) The optical unit of the smokemeter shall be mounted radially to the exhaust pipe so that the measurement will be made at right angles to the axis of the exhaust plume. The distance from the optical centerline to the exhaust pipe outlet shall be 5 ±1 inch. The full flow of the exhaust stream shall be centered between the source and detector apertures (or windows and lenses) and on the axis of the light beam.

(2) Power shall be supplied to the control unit of the smokemeter in time to allow at least 15 minutes for stabilization prior to testing.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52203, Nov. 16, 1983, as amended at 49 FR 48141, Dec. 10, 1984]

§ 86.884-10 Information.

The following information, as applicable, shall be recorded for each test:

(a) Engine description and specifications. A copy of the information specified in this paragraph must accompany each engine sent to the Administrator for compliance testing. If the engine is submitted to the Administrator for testing under Subpart N, only the information specified in § 86.1344-84 need accompany the engine. The manufacturer need not record the information specified in this paragraph for each test if the information, with exception of paragraphs (a)(3), (a)(12), and (a)(13) of this section, is included in the manufacturer's Part I.

(1) Engine-system combination.

(2) Engine identification numbers.

(3) Number of hours of operation accumulated on engine.

(4) Rated maximum horsepower and torque.

(5) Maximum horsepower and torque speeds.

(6) Engine displacement.

(7) Governed speed.

(8) Curb-idle rpm.

(9) Fuel consumption at maximum power and torque.

(10) Maximum air flow.

(11) Maximum and test air inlet restriction.

(12) Exhaust pipe diameter(s).

(13) Maximum exhaust system backpressure.

(b) *Test data; general.* This information may be recorded at any time between four hours prior to the test and four hours after the test.

(1) Engine-system combination.

(2) Engine identification numbers.

(3) Instrument operator.

(4) Engine operator.

(5) Number of hours of operation accumulated on the engine prior to beginning the warm-up portion of the test.

(6) Calibration date(s) of neutral density filters used to calibrate the smokemeter.

(c) Test data; pre-test.

(1) Date and time of day.

(2) Test number.

(3) Barometric pressure.

(4) [Reserved]

(5) Intake air humidity and temperature:

(i) *Humidity-conditioned air supply.* Air that has had its absolute humidity altered is considered humidity-conditioned air. For this type of intake air supply, the humidity measurement must be made within the intake air supply system, and after the humidity conditioning has taken place.

(ii) *Non-conditioned air supply.* Humidity measurements in non-conditioned intake air supply systems must be made in the intake air stream entering the supply system and within 18 inches of the inlet for supply system. Alternatively, the humidity measurements can be measured within the intake air supply stream.

(iii) Engine intake air temperature measurement must be made within 48 inches of the engine. The measurement location must be made either in the supply system or in the air stream entering the supply system.

(d) *Test data; modal.* (1) Observed engine torque and speed during the steady-state test conditions specified in § 86.884-7(a)(3)(i).

(2) On the recorder or automatic data collection equipment: Identify zero traces—calibration traces—idle traces (or printout of the zero and calibration values)—closed-throttle trace—open throttle trace—acceleration and lugdown test traces—start and finish of each test.

[48 FR 52203, Nov. 16, 1983, as amended at 49 FR 48141, Dec. 10, 1984]

§ 86.884-11 Instrument checks.

(a) The smokemeter shall be checked according to the following procedure prior to each test:

(1) [Reserved]

(2) The zero control shall be adjusted under conditions of "no smoke" to give a recorder or data collection equipment response of zero;

(3) Calibrated neutral density filters having approximately 10, 20, and 40 percent opacity shall be employed to check the linearity of the instrument. The filter(s) shall be inserted in the light path perpendicular to the axis of the beam and adjacent to the opening from which the beam of light from the light source emanates, and the recorder response shall be noted. Filters with exposed filtering media should be checked for opacity every six months; all other filters shall be checked every year, using NBS or equivalent reference filters. Deviations in excess of 1 percent of the nominal opacity shall be corrected.

(b) The instruments for measuring and recording engine rpm, engine torque, air inlet restrictions, exhaust system backpressure, throttle position, etc., which are used in the test prescribed herein, shall be calibrated in accordance with good engineering practice.

[48 FR 52203, Nov. 16, 1983, as amended at 49 FR 48141, Dec. 10, 1984]

§ 86.884-12 Test run.

(a) The temperature of the air supplied to the engine shall be between 68 °F and 86 °F. The engine fuel inlet temperature shall be 100 °F ±10 °F and shall be measured at a point specified by the manufacturer. The observed barometric pressure shall be between 28.5 inches and 31 inches Hg. Higher air temperature or lower barometric pressure may be used, if desired, but no allowance will be made for possible increased smoke emissions because of such conditions.

(b) The governor and fuel system shall have been adjusted to provide engine performance at the levels in the application for certification required under § 86.084-21.

(c) The following steps shall be taken for each test:

(1) Start cooling system;

(2) Warm up the engine by the procedure described in § 86.1332-84(d)(3)(i) through (v).

(3) Determine by experimentation the dynamometer inertia and dynamometer load required to perform the acceleration in the dynamometer cycle for smoke emission tests (§ 86.884-7(a)(2)). In a manner appropriate for the dynamometer and controls being used, arrange to conduct the acceleration mode;

(4) Install smokemeter optical unit and connect it to the recorder/data collection system. Connect the engine rpm and throttle position sensing devices to the recorder/data collection system;

(5) Turn on purge air to the optical unit of the smokemeter, if purge air is used;

(6) Check and record zero and span settings of the smokemeter. (If a recorder is used, a chart speed of approximately one inch per minute shall be used.) The optical unit shall be retracted from its position about the exhaust stream if the engine is left running.

(7) Precondition the engine by operating it for 10 minutes at maximum rated horsepower;

(8) Proceed with the sequence of smoke emission measurements on the engine dynamometer as prescribed in § 86.884-7;

(9)(i) During the test sequence of § 86.884-7, continuously record smoke measurements, engine rpm, and throttle position.

(ii) If a chart recorder is used for data collection, it shall be run at a minimum chart speed of one inch per minute during the idle mode and transitional periods, and eight inches per minute during the acceleration and lugging modes.

(iii) Automatic data collection equipment, if used, shall sample at least two records per second.

(iv) The smoke meter zero and full scale response may be rechecked and reset during the idle mode of each test sequence.

(v) If either zero or full-scale drift is in excess of 2 percent opacity, the smokemeter controls must be readjusted and the test must be repeated;

(10) Turn off engine;

(11)(i) Check zero and reset if necessary.

(ii) Check span response (*linearity*) of the smokemeter by inserting neutral density filters.

(iii) If either zero drift *or the linearity check* is in excess of two percent opacity, the results shall be invalidated.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52203, Nov. 16, 1983, as amended at 49 FR 48141, Dec. 10, 1984; 52 FR 47870, Dec. 16, 1987]

§ 86.884-13 Data analysis.

The following procedure shall be used to analyze the test data:

(a) Locate the modes specified in § 86.884-7(a)(1) through (a)(4) by applying the following starting and ending criteria:

(1) The idle mode specified in § 86.884-7(a)(1) starts when engine preconditioning or the lugging mode of a preceding cycle has been completed and ends when the engine speed is raised above the idle speed.

(2) The acceleration mode specified in § 86.884-7(a)(2)(i) starts when the preceding idle mode has been completed and ends when the throttle is in the fully open position, as indicated by the throttle position trace as specified in § 86.884-7(a)(2)(ii).

(3) The acceleration mode specified in § 86.884-7(a)(2)(ii) starts when the preceding acceleration mode has been completed and ends when the engine speed reaches 85 percent of the rated speed.

(4) The transition period specified in § 86.884-7(a)(2)(iii) starts when the preceding acceleration mode has been completed and ends when the throttle is in the fully open position as indicated by the throttle position trace, as specified in § 86.884-7(a)(2)(iv).

(5) The acceleration mode specified in § 86.884-7(a)(2)(iv) starts when the preceding transition period has been completed and ends when the engine speed reaches 95 percent of the rated speed.

(6) The transition period specified in § 86.884-7 (a)(3)(i) starts when the preceding acceleration mode has been completed and ends when the engine speed is 50 rpm below the rated speed and the provisions of § 86.884-7 (a)(3)(i) are met.

(7) The lugging mode specified in § 86.884-7(a)(3)(ii) starts when the preceding transition period has been completed and ends when the engine speed is at the intermediate speed.

(b) Determine if the test requirements of § 86.884-7 are met by applying the following modal criteria:

(1) Idle mode as specified in § 86.884-7(a)(1):

(i) Duration: 5 to 5.5 minutes.

(ii) Speed: within specification during the last four minutes of the mode.

(2) Acceleration mode as specified in § 86.884-7(a)(2)(i).

(i) Duration: three seconds or less.

(ii) Speed increase: 200±50 rpm.

(3) Acceleration mode as specified in § 86.884-7(a)(2)(ii);

(i) Linearity: ±100 rpm as specified in paragraph (c) of this section.

(ii) Duration: 3.5 to 6.5 seconds.

(iii) Throttle position: fully open until speed is at least 85 percent of the rated speed.

(4) Transition period as specified in § 86.884-7(a)(2)(iii):

(i) Throttle position: moved rapidly to, and held in, the fully closed position.

(5) Acceleration mode as specified in § 86.884-7(a)(2)(iv):

(i) Duration: 8 to 12 seconds.

(ii) Throttle position: fully open when speed is at intermediate speed.

(6) Transition period as specified in § 86.884-7(a)(3)(i):

(i) Duration: 50 to 60 seconds.

(ii) Speed during last 10 seconds within ±50 rpm of rated speed.

(iii) Corrected power during last 10 seconds: At least 95 percent of horsepower developed during zero-hour testing.

(7) Lugging mode as specified in § 86.884-7(a)(3)(ii):

(i) Linearity: ±100 rpm as specified in paragraph (c) of this section.

(ii) Duration: 30 to 40 seconds.

(iii) Speed at end: intermediate speed.

(c) Determine if the linearity requirements of § 86.884-7 were met by means of the following procedure:

(1) For the acceleration mode specified in § 86.884-7(a)(2)(ii), note the maximum deflection of the rpm trace from a straight line drawn between the starting and ending points specified in paragraph (a)(3) of this section.

(2) For the lugging mode specified in § 86.884-7(a)(3)(ii), note the maximum deflection of the rpm trace from a straight line drawn from the starting and ending points specified in paragraph (a)(7) of this section.

(3) The test results will be invalid if any deflection is greater than 100 rpm.

(4) This linearity check may be performed by direct analysis of the recorder traces, or by computer analysis of data collected by automatic data collection equipment.

(d) Analyze the smoke trace by means of the following procedure:

(1) Starting at the beginning of the first acceleration, as defined in paragraph (a)(2) of this section, and stopping at the end of the second acceleration, as defined in paragraph (a)(3) of this section, divide the smoke trace into half-second intervals. Similarly, subdivide into half-second intervals the third acceleration mode and the lugging mode as defined by paragraphs (a) (5) and (7) respectively, of this section.

(2) Determine the average smoke reading during each half-second interval.

(3) Locate and record the 15 highest half-second readings during the acceleration mode of each dynamometer cycle.

(4) Locate and record the five highest half-second readings during the lugging mode of each dynamometer cycle.

(5) Examine the average half-second values which were determined in paragraphs (d)(3) and (d)(4) of this section and record the three highest values for each dynamometer cycle.

(6) This smoke trace analysis may be performed by direct analysis of the recorder traces, or by computer analysis of data collected by automatic data collection equipment.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52203, Nov. 16, 1983, as amended at 49 FR 48141, Dec. 10, 1984]

§ 86.884-14 Calculations.

(a) Average the 45 readings in § 86.884-13(d)(3) and designate the value as "A".

(b) Average the 15 readings in § 86.884-13(d)(4) and designate the value as "B".

(c) Average the 9 readings in § 86.884-13(d)(5) and designate the value as "C".

Subpart J—[Reserved]

Subpart K—Selective Enforcement Auditing of New Heavy-Duty Engines and Light-Duty Trucks

SOURCE: 45 FR 63772, Sept. 25, 1980, unless otherwise noted.

§ 86.1001-84 Applicability.

The provisions of this subpart are applicable for 1984 and later model year heavy-duty engines and light-duty trucks.

[54 FR 14559, Apr. 11, 1989]

§ 86.1002-84 Definitions.

(a) The definitions in this section apply to this subpart.

(b) As used in this subpart, all terms not defined herein have the meaning given them in the Act.

"Acceptable Quality Level" (AQL) means the maximum percentage of failing engines or vehicles, that for purposes of sampling inspection, can be considered satisfactory as a process average.

"Configuration" means a subclassification, if any, of a heavy-duty engine family for which a separate projected sales figure is listed in the manufacturer's Application for Certification and which can be described on the basis of emission control system, governed speed, injector size, engine calibration, and other parameters which may be designated by the Administrator, or a subclassification of a light-duty truck engine family/emission control system combination on the basis of engine code, inertia weight class, transmission type and gear ratios, axle ratio, and other parameters which may be designated by the Administrator.

"Compliance level" means an emission level determined during a Production Compliance Audit pursuant to Subpart L of this part.

"Test Sample" means the collection of vehicles or engines of the same configuration which have been drawn from the population of engines or vehicles of that configuration and which will receive exhaust emission testing.

"Inspection Criteria" means the pass and fail numbers associated with a particular sampling plan.

"Test Engine" means an engine in a test sample.

"Test Vehicle" means a vehicle in a test sample.

[45 FR 63772, Sept. 25, 1980, as amended at 48 FR 52207, Nov. 16, 1983; 50 FR 35386, Aug. 30, 1985]

§ 86.1003–88 Test orders.

(a) The Administrator shall require any testing under this subpart by means of a test order addressed to the manufacturer.

(b) The test order will be signed by the Assistant Administrator for Air, Noise and Radiation or his designee. The test order will be delivered in person by an EPA Enforcement Officer to a company representative or sent by registered mail, return receipt requested, to the manufacturer's representative who signs the Application for Certification submitted by the manufacturer pursuant to the requirements of the applicable section of Subpart A of this part. Upon receipt of a test order, the manufacturer shall comply with all of the provisions of this subpart and instructions in the test order.

(c)(1) The test order will specify the engine or vehicle configuration selected for testing, the manufacturer's vehicle or engine assembly plant or associated storage facility from which the engines or vehicles must be selected, the time and location at which engines or vehicles must be selected, and the procedure by which engines or vehicles of the specified configuration must be selected. The test order may specify the number of vehicles or engines to be selected per day.

(i) If total production of the specified vehicle configuration is less than the number specified in the test order, the manufacturer will select the actual number of vehicles produced per day.

(ii) Heavy-duty engine manufacturers will be required to select a minimum of four engines per day unless an alternate selection procedure is approved pursuant to § 86.1007–84(a) or unless total production of the specified configuration is less than four engines per day. If total production of the specified configuration is less than four engines per day, the manufacturer will select the actual number of engines produced per day.

(2) The test order may include alternative configurations to be selected for testing in the event that engines or vehicles of the specified configuration are not available for testing because those engines or vehicles are not being manufactured during the specified time, or not being stored at the specified assembly plant or associated storage facilities.

(3) If the specified configuration is not being manufactured at a rate of at least four vehicles per day, in the case of light-duty truck manufacturers, two engines per day, in the case of heavy-duty engine manufacturers specified in paragraph (g)(1) of § 86.1008–84, or one engine per day, in the case of heavy-duty engine manufacturers specified in paragraph (g)(2) of § 86.1008–84, over the expected duration of the audit, the Assistant Administrator or his designated representative may select engines or vehicles of the alternate configuration for testing.

(4) In addition, the test order may include other directions or information essential to the administration of the required testing.

(d) A manufacturer may submit a list of engine families and the corresponding assembly plants or associated storage facilities from which the manufacturer prefers to have engines or vehicles selected for testing in response to a test order. In order that a manufacturer's preferred location be considered for inclusion in a test order for a configuration of a particular engine family, the list must be submitted prior to issuance of the test order. Notwithstanding the fact that a manufacturer has submitted the above list, the Administrator may order selection at other than a preferred location.

(e) Upon receipt of a test order, a manufacturer shall proceed in accordance with the provisions of this subpart.

(f)(1) During a given model year, the Administrator shall not issue to a manufacturer more Selective Enforcement Auditing (SEA) test orders than an annual limit determined by the following:

(i) For manufacturers of heavy-duty engines, either gasoline-fueled or diesel, the number determined by dividing the projected heavy-duty engine sales bound for the United States market for that year, as made by the manufacturer in its Application for Certification, by 30,000 and rounding to the nearest whole number, unless the projected sales are less than 15,000, in which case the number is one;

(ii) For manufacturers of gasoline-fueled or diesel light-duty trucks, the number determined by dividing the projected light-duty truck sales bound for the United States market for that model year, as made by the manufacturer in its report submitted under paragraph (a)(2) of § 600.207-80 of the Automobile Fuel Economy Regulations, by 300,000 and rounding to the nearest whole number, unless the projected sales are less than 150,000, in which case the number is one.

(iii) If a manufacturer submits to EPA in writing prior to or during the model year a reliable sales projection update, that update will be used for recalculating the manufacturer's annual limit of SEA test orders.

(2) Any SEA test order for which the configuration fails in accordance with § 86.1010-84 or for which testing is not completed will not be counted against the annual limit.

(3) When the annual limit has been met, the Administrator may issue additional test orders for those configurations for which evidence exists indicating noncompliance. An SEA test order issued on this basis will include a statement as to the reason for its issuance.

(Approved by the Office of Management and Budget under control number 2060-0064)

[45 FR 63772, Sept. 25, 1980, as amended at 48 FR 52207, Nov. 16, 1983; 49 FR 48141, Dec. 10, 1984. Redesignated and amended at 54 FR 2123, Jan. 19, 1989]

§ 86.1003-90 Test orders.

(a) The Administrator shall require any testing under this subpart by means of a test order addressed to the manufacturer.

(b) The test order will be signed by the Assistant Administrator for Air and Radiation or his designee. The test order will be delivered in person by an EPA Enforcement Officer to a company representative or sent by registered mail, return receipt requested, to the manufacturer's representative who signs the Application for Certification submitted by the manufacturer pursuant to the requirements of this applicable section of Subpart A of this part. Upon receipt of a test order, the manufacturer shall comply with all of the provisions of this subpart and instructions in the test order.

(c)(1) The test order will specify the engine or vehicle configuration selected for testing, the manufacturer's vehicle or engine assembly plant or associated storage facility from which the engines or vehicles must be selected, the time and location at which engines or vehicles must be selected, and the procedure by which engines or vehicles of the specified configuration must be selected. The test order may specify the number of vehicles or engines to be selected per day.

(i) If the total production of the specified vehicle configuration is less than the number specified in the test order, the manufacturer will select the actual number of vehicles produced per day.

(ii) Heavy-duty engine manufacturers will be required to select a minimum of four engines per day unless an alternate selection procedure is approved pursuant to § 86.1007-84(a) or unless total production of the specified configuration is less than four engines per day. If total production of the specified configuration is less than four engines per day, the manufacturer will select the actual number of engines produced that day.

(2) The test order may include alternative configurations to be selected for testing in the event that engines or vehicles of the specified configuration

are not available for testing because those engines or vehicles are not being manufactured during the specified time, or not being stored at the specified assembly plant or associated storage facilities.

(3) If the specified configuration is not being manufactured at a rate of at least four vehicles per day, in the case of light-duty truck manufacturers, two engines per day, in the case of heavy-duty engine manufacturers specified in paragraph (g)(1) of § 86.1008-84 or one engine per day, in the case of heavy-duty engine manufacturers specified in paragraph (g)(2) of § 86.1008-90, over the expected duration of the audit, the Assistant Administrator or his designated representative may select engines or vehicles of the alternate configuration for testing.

(4) In addition, the test order may include other directions or information essential to the administration of the required testing.

(d) A manufacturer may submit a list of engine families and the corresponding assembly plants or associated storage facilities from which the manufacturer prefers to have engines or vehicles selected for testing or response to a test order. In order that a manufacturer's preferred location be considered for inclusion in a test order for a configuration of a particular engine family, the list must be submitted prior to issuance of the test order. Notwithstanding the fact that a manufacturer has submitted the above list, the Administrator may order selection at other than a preferred location.

(e) Upon receipt of a test order, a manufacturer shall proceed in accordance with the provisions of this subpart.

(f)(1) During a given model year, the Administrator shall not issue to a manufacturer more Selective Enforcement Audit (SEA) test orders than an annual limit determined by the following:

(i) For manufacturers of heavy-duty engines, either petroleum-fueled or methanol-fueled, the number determined by dividing the projected heavy-duty engine sales bound for the United States market for that year, as made by the manufacturer in its Application for Certification, by 30,000 and rounding to the nearest whole number, unless the projected sales are less than 15,000, in which case the number is one;

(ii) For manufacturers of petroleum-fueled or methanol-fueled light-duty trucks, the number determined by dividing the projected light-duty truck sales bound for the United States market for that model year, as made by the manufacturer in its report submitted under paragraph (a)(2) of § 600.207-80 of the Automobile Fuel Economy Regulations, by 300,000 and rounding to the nearest whole number, unless the projected sales are less than 150,000, in which case the number is one.

(iii) If a manufacturer submits to EPA in writing prior to or during the model year a reliable sales projection update, that update will be used for recalculating the manufacturer's annual limit of SEA test orders.

(2) Any SEA test order for which the configuration fails in accordance with § 86.1010 or for which testing is not completed will not be counted against the annual limit.

(3) When the annual limit has been met, the Administrator may issue additional test orders for those configurations for which evidence exists indicating noncompliance. An SEA test order issued on this basis will include a statement as to the reason for its issuance.

[54 FR 14559, Apr. 11, 1989]

§ 86.1004-84 Testing by the Administrator

(a) The Administrator may require by test order that engines or vehicles of a specified configuration be selected in a manner consistent with the requirements of § 86.1007-84 and submitted to him at such place as he may designate for the purpose of conducting emission tests. These tests will be conducted in accordance with § 86.1008-84 of these regulations to determine whether engines or vehicles manufactured by the manufacturer conform with the regulations with respect to which the certificate of conformity was issued.

(b)(1) Whenever the Administrator conducts a test on a test engine or vehicle or the Administrator and manu facturer each conduct a test on the same test engine or vehicle, the results of the Administrator's test will comprise the official data for that engine or vehicle.

(2) Whenever the manufacturer conducts all tests on a test engine or vehicle, the manufacturer's test data will be accepted as the official data: *Provided*, That if the Administrator makes a determination based on testing under paragraph (a) of this section that there is a substantial lack of agreement between the manufacturer's test results and the Administrator's test results, no manufacturer's test data from the manufacturer's test facility will be accepted for purposes of this subpart.

(c) If testing conducted under paragraph (a) of this section demonstrates a lack of agreement under paragraph (b)(2) of this section, the Administrator shall:

(1) Notify the manufacturer in writing of his determination that the test facility is inappropriate for conducting the tests required by this subpart and the reasons therefor; and

(2) Reinstate any manufacturer's data upon a showing by the manufacturer that the data acquired under paragraph (a) of this section was erroneous and the manufacturer's data was correct.

(d) The manufacturer may request in writing that the Administrator reconsider his determination in paragraph (b)(2) of this section based on data or information which indicates that changes have been made to the test facility and these changes have resolved the reasons for disqualification.

§ 86.1005–88 Maintenance of records; submittal of information.

(a) The manufacturer of any new gasoline-fueled or diesel heavy-duty engine or light-duty truck subject to any of the provisions of this subpart shall establish, maintain, and retain the following adequately organized and indexed records:

(1) *General records*. A description of all equipment used to test engines or vehicles in accordance with § 86.1008–84 pursuant to a test order issued under this subpart, specifically:

(i) If testing heavy-duty gasoline engines, the equipment requirements specified in §§ 86.1306–84 and 86.1506–84 of this part;

(ii) If testing heavy-duty diesel engines, the equipment requirements specified in §§ 86.1306–84, 86.884–8 and 86.884–9 of this part;

(iii) If testing light-duty gasoline-fueled trucks, the equipment requirements specified in §§ 86.106 (excluding all references to evaporative and particulate emission testing) and 86.1506–84 of this part; and

(iv) If testing light-duty diesel trucks, the equipment requirements specified in § 86.106 (excluding all references to evaporative emission testing) of this part.

(2) *Individual records*. These records pertain to each audit conducted pursuant to this subpart.

(i) The date, time, and location of each test;

(ii) The number of hours of service accumulated on the engine or the number of miles on the vehicle when the test began and ended;

(iii) The names of all supervisory personnel involved in the conduct of the audit;

(iv) A record and description of any repairs performed prior to and/or subsequent to approval by the Administrator, giving the date and time of the repair, the reason for it, the person authorizing it, and the names of all supervisory personnel resnsible for the conduct of the repair;

(v) The date when the engine or vehicle was shipped from the assembly plant or associated storage facility and when it was received at the testing facility;

(vi) A complete record of all emission tests performed pursuant to this subpart (except test performed by EPA directly), including all individual worksheets and/or other documentation relating to each test, or exact copies thereof, specifically—

(A) If testing heavy-duty gasoline engines, the record requirements specified in § 86.1344–88 and § 86.1542–84 of this part;

(B) If testing heavy-duty diesel engines, the record requirements specified in § 86.1344–88 and § 86.884–10 of this part;

(C) If testing light-duty gasoline-fueled trucks, the record requirements specified in § 86.142-82 and § 86.1542-84 of this part; and

(D) If testing light-duty diesel trucks, the record requirements specified in § 86.142-82 of this part; and

(vii) A brief description of any significant audit events commencing with the test engine or vehicle selection process, but not described by any subparagraph under paragraph (a)(2) of this section, including such extraordinary events as engine damage during shipment or vehicle accident.

(viii) A paper copy of the driver's trace for each test.

(3) The manufacturer shall record test equipment description, pursuant to pargraph (a)(1) of this section, for each test cell that can be used to perform emission testing under this subpart.

(b) The manufacturer shall retain all records required to be maintained under this subpart for a period of one (1) year after completion of all testing in response to a test order. Records may be retained as hard copy or reduced to microfilm, punch cards, etc., depending upon the manufacturer's record retention procedure: *Provided*, That in every case all the information contained in the hard copy is retained.

(c) Pursuant to a request made by the Administrator, the manufacturer shall submit the following information with regard to engine or vehicle production:

(1) Number of engines or vehicles, by configuration and assembly plant, scheduled for production for the time period designated in the request.

(2) Number of engines or vehicles, by configuration and assembly plant, produced during the time period designated in the request which are complete for introduction into commerce.

(d) Nothing in this section limits the Administrator's discretion in requiring the manufacturer to retain additional records or submit information not specifically required by this section.

(e) The manufacturer shall address all reports, submissions, notifications, and requests for approvals made under this subpart to: Director, Manufacturers Operations Division, U.S. Environmental Protection Agency, EN-340F, 401 M Street SW., Washington, DC 20460.

(Approved by the Office of Management and Budget under the control number 2060-0064)

[45 FR 63772, Sept. 25, 1980, as amended at 48 FR 52208, Nov. 16, 1983. Redesignated and amended at 54 FR 2123, Jan. 19, 1989]

§ 86.1005-90 Maintenance of records; submittal of information.

(a) The manufacturer of any new petroleum-fueled or methanol-fueled heavy-duty engine or light-duty truck subject to any of the provisions of this subpart shall establish, maintain, and retain the following adequately organized and indexed records:

(1) *General records.* A description of all equipment used to test engines or vehicles in accordance with § 86.1008 pursuant to a test order issued under this subpart, specifically:

(i) If testing heavy-duty gasoline-fueled or methanol-fueled Otto-cycle engines, the equipment requirements specified in §§ 86.1306 and 86.1506 of this part;

(ii) If testing heavy-duty petroleum-fueled or methanol-fueled diesel engines, the equipment requirements specified in §§ 86.1306-84, 86.884-8, and 86.884-9 of this part.

(iii) If testing gasoline-fueled or methanol-fueled Otto-cycle light-duty trucks, the equipment requirements specified in §§ 86.106 (excluding all references to evaporative and particulate emission testing) and 86.1506-84 of this part; and

(iv) If testing petroleum-fueled or methanol-fueled diesel light-duty trucks, the equipment requirements specified in §§ 86.106 (excluding all references to evaporative emission testing) and 86.1506-83 of this part.

(2) *Individual records.* These records pertain to each audit conducted pursuant to this subpart.

(i) The date, time, and location of each test;

(ii) The number of hours of service accumulated on each engine or the number of miles on the vehicle when the test began and ended;

(iii) The names of all supervisory personnel involved in the conduct of the audit;

(iv) A record and description of any repairs performed prior to and/or subsequent to approval by the Administrator, giving the date and time of the repair, the reason for it, the person authorizing it, and the names of all supervisory personnel responsible for the conduct of the repair;

(v) The date when the engine or vehicle was shipped from the assembly plant or associated storage facility and when it was received at the testing facility;

(vi) A complete record of all emission tests performed pursuant to this subpart (except tests performed by EPA directly), including all individual worksheets and/or other documentation relating to each test, or exact copies thereof, specifically

(A) If testing gasoline-fueled or methanol-fueled Otto-cycle heavy-duty engines, the record requirements specified in §§ 86.1342 and 86.1542 of this part;

(B) If testing petroleum-fueled or methanol-fueled diesel heavy-duty engines, the record requirements specified in §§ 86.1342, 86.1542, and 86.884-10;

(C) If testing gasoline-fueled or methanol-fueled Otto-cycle light-duty trucks, the record requirements specified in §§ 86.142 (excluding all references to diesel vehicles) and 86.1542; and

(D) If testing petroleum-fueled or methanol-fueled diesel light-duty trucks, the record requirements specified in § 86.142; and

(vii) A brief description of any significant audit events commencing with the test engine or vehicle selection process, but not described by any subparagraph under paragraph (a)(2) of this section, including such extraordinary events as engine damage during shipment or vehicle accident.

(viii) A paper copy of the driver's trace for each test.

(3) The manufacturer shall record test equipment description, pursuant to paragraph (a)(1) of this section, for each test cell that can be used to perform emission testing under this subpart.

(b) The manufacturer shall retain all records required to be maintained under this subpart for a period of one (1) year after completion of all testing in response to a test order. Records may be retained as hard copy or reduced to microfilm, punch cards, etc., depending upon the manufacturer's record retention procedure: *Provided*, that in every case all information contained in the hard copy is retained.

(c) Pursuant to a request made by the Administrator, the manufacturer shall submit to him the following information with regard to engine or vehicle production:

(1) Number of engines or vehicles, by configuration and assembly plant, scheduled for production for the time period designated in the request.

(2) Number of engines or vehicles, by configuration and assembly plan, produced during the time period designated in the request which are complete form introduction into commerce.

(d) Nothing in this section limits the Administrator's discretion in requiring the manufacturer to retain additional records or submit information not specifically required by this section.

(e) The manufacturer shall address all reports, submissions, notifications, and requests for approvals made under this subpart to: Director, Manufacturers Operations Division, U.S. Environmental Protection Agency, EN-340, 401 M Street, SW., Washington, DC 20460.

[54 FR 14560, Apr. 11, 1989]

§ 86.1006-84 Entry and access.

(a) To allow the Administrator to determine whether a manufacturer is complying with the provisions of this subpart and a test order issued thereunder, EPA Enforcement Officers are authorized to enter during operating hours and upon presentation of credentials any of the following:

(1) Any facility where any engine or vehicle to be introduced into commerce or any emission related component is manufactured, assembled, or stored;

(2) Any facility where any tests conducted pursuant to a test order or any procedures or activities connected with these tests are or were performed;

best copy available

(3) Any facility where any engine or vehicle which is being tested, was tested, or will be tested is present; and

(4) Any facility where any record or other document relating to any of the above is located.

(b) Upon admission to any facility referred to in paragraph (a) of this section, EPA Enforcement Officers are authorized to perform the following inspection-related activities:

(1) To inspect and monitor any aspects of engine or vehicle manufacture, assembly, storage, testing and other procedures, and the facilities in which these procedures are conducted;

(2) To inspect and monitor any aspect of engine or vehicle test procedures or activities, including, but not limited to, monitoring engine or vehicle selection, preparation, service or mileage accumulation, preconditioning, emission test cycles, and maintenance; and to verify calibration of test equipment;

(3) To inspect and make copies of any records or documents related to the assembly, storage, selection and testing of an engine or vehicle in compliance with a test order; and

(4) To inspect and photograph any part or aspect of any engine or vehicle and any component used in the assembly thereof that is reasonably related to the purpose of the entry.

(c) EPA Enforcement Officers are authorized to obtain reasonable assistance without cost from those in charge of a facility to help them perform any function listed in this subpart and are authorized to request the recipient of a test order to make arrangements with those in charge of a facility operated for its benefit to furnish reasonable assistance without cost to EPA whether or not the recipient controls the facility.

(d) EPA Enforcement Officers are authorized to seek a warrant or court order authorizing the EPA Enforcement Officers to conduct activities related to entry and access as authorized in this section, as appropriate, to execute the functions specified in this section. EPA Enforcement Officers may proceed *ex parte* to obtain a warrant whether or not the Enforcement Officers first attempted to seek permission of the recipient of the test order or the party in charge of the facilities in question to conduct activities related to entry and access as authorized in this section.

(e) A recipient of a test order shall permit EPA Enforcement Officers who present a warrant or court order as described in paragraph (d) of this section to conduct activities related to entry and access as authorized in this section and as described in the warrant or court order. The recipient shall cause those in charge of its facility or a facility operated for its benefit to permit EPA Enforcement Officers to conduct activities related to entry and access as authorized in this section pursuant to a warrant or court order whether or not the recipient controls the facility. In the absence of such a warrant or court order, EPA Enforcement Officers may conduct activities related to entry and access as authorized in this section only upon the consent of the recipient of the test order or the party in charge of the facilities in question.

(f) It is not a violation of this part or the Clean Air Act for any person to refuse to permit EPA Enforcement Officers to conduct activities related to entry and access as authorized in this section without a warrant or court order.

(g) A manufacturer is responsible for locating its foreign testing and manufacturing facilities in jurisdictions in which local foreign law does not prohibit EPA Enforcement Officers from conducting the entry and access activities specified in this section. EPA will not attempt to make any inspections which it has been informed that local foreign law prohibits.

(h) For purposes of this section, the following definitions are applicable:

(1) "Presentation of Credentials" means display of the document designating a person as an EPA Enforcement Officer.

(2) Where engine or vehicle storage areas or facilities are concerned, "operating hours" means all times during which personnel other than custodial personnel are at work in the vicinity of the area or facility and have access to it.

(3) Where facilities or areas other than those covered by paragraph

(h)(2) of this section are concerned, "operating hours" means all times during which an assembly line is in operation, engine or vehicle assembly is taking place, testing, repair, service accumulation, production or compilation of records is taking place, or any other procedure or activity related to engine or vehicle manufacture, assembly or testing is being carried out in a facility.

(4) "Reasonable assistance" includes, but is not limited to, clerical, copying, interpreting and translating services, and the making available on an EPA Enforcement Officer's request of personnel of the facility being inspected during their working hours to inform the EPA Enforcement Officer of how the facility operates and to answer his or her questions. Any employee whom an EPA Enforcement Officer requests the manufacturer to cause to appear for questioning will be entitled to be accompanied, represented and advised by counsel.

[45 FR 63772, Sept. 25, 1980, as amended at 48 FR 52208, Nov. 16, 1983]

§ 86.1007–84 Sample selection.

(a) Engines or vehicles comprising a test sample which are required to be tested, pursuant to a test order issued in accordance with this subpart, will be selected at the location and in the manner specified in the test order. If a manufacturer determines that the test engines or vehicles cannot be selected in the manner specified in the test order, an alternative selection procedure may be employed: *Provided*, That the manufacturer requests approval of the alternative procedure in advance of the start of test sample selection and that the Administrator approves the procedure.

(b) The manufacturer shall have assembled the test engines or vehicles of the configuration selected for testing using its normal mass production process for engines or vehicles to be distributed into commerce. During the audit, the manufacturer shall inform the Administrator of any change(s) implemented in its production processes, including quality control, which may reasonably be expected to affect the emissions of the vehicles or engines selected, between the time the manufacturer is notified of a test order and the time the manufacturer finishes selecting test vehicles or engines. In the case of heavy-duty engines, if the test engines are selected at a location where they do not have their operational and emission control systems installed, the test order will specify the manner and location for selection of components to complete assembly of the engines. The manufacturer shall assemble these components onto the test engines using normal assembly and quality control procedures as documented by the manufacturer.

(c) No quality control, testing, or assembly procedures will be used on the completed test engine or vehicle or any portion thereof, including parts and subassemblies, that has not been or will not be used during the production and assembly of all other engines or vehicles of that configuration, except, that the Administrator may approve a modification in the normal assembly procedures pursuant to paragraph (b) of this section.

(d) The test order may specify that EPA Enforcement Officers, rather than the manufacturer, will select the test engines or vehicles according to the method specified in the test order.

(e) The order in which test engines or vehicles are selected determines the order in which test results are to be used in applying the sampling plan in accordance with § 86.1010–84.

(f) The manufacturer shall keep on hand all untested engines or vehicles, if any, comprising the test sample until such time as a pass or fail decision is reached in accordance with § 86.1010–84(d). The manufacturer may ship any tested engine or vehicle which has not failed in accordance with § 86.1010–84(b). However, once the manufacturer ships any test engine or vehicle, it relinquishes the prerogative to conduct retests as provided in § 86.1008–84(i).

[45 FR 63772, Sept. 25, 1980, as amended at 48 FR 52208, Nov. 16, 1983]

§ 86.1008–88 Test procedures.

(a)(1) For heavy-duty engines, the prescribed test procedure is the Federal Test Procedure as described in Subparts N, I, and P of this part.

(2) If a heavy-duty diesel engine manufacturer uses the test procedure in Subpart D of this part to certify 1984 model year engines pursuant to § 86.084-11(a)(1) (i)(B), (ii)(B), (iii)(B), and (a)(2), that manufacturer shall use the test procedure in Subpart D when conducting emission tests on those engines pursuant to this subpart.

(3) For light-duty trucks, the prescribed test procedure is the Federal Test Procedure as described in Subparts B and P of this part. The manufacturer shall not perform the evaporative emission test procedure contained in Subpart B.

(4) When testing light-duty trucks the following exceptions to the test procedures in Subpart B are applicable:

(i) The manufacturer may use test fuel meeting the specifications of paragraph (a)(1) or (b)(2) of § 86.113-79 for mileage accumulation. Otherwise, the manufacturer may use fuels other than those specified in this section only with advance approval of the Administrator.

(ii) The manufacturer may measure the temperature of the test fuel at other than the approximate mid-volume of the fuel tank, as specified in paragraph (a) of § 86.131, and may drain the test fuel from other than the lowest point of the fuel tank, as specified in paragraph (b) of § 86.131, provided an equivalent method is used. Equivalency documentation shall be maintained by the manufacturer and shall be made available to the Administrator upon request.

(iii) The manufacturer may perform additional preconditioning on SEA test vehicles other than the preconditioning specified in § 86.132 only if the additional preconditioning had been performed on certification test vehicles of the same configuration.

(iv) The manufacturer shall perform the heat build procedure 11 to 34 hours following vehicle preconditioning rather than according to the time period specified in paragraph (a) of § 86.133. All references in § 86.133 to an evaporative emission enclosure (SHED) and analyzing for HC during the heat build can be ignored.

(v) The manufacturer may substitute slave tires for the drive wheel tires on the vehicle as specified in paragraph (e) of § 86.135: *Provided*, That the slave tires are the same size.

(vi) The cold start exhaust emission test described in § 86.137 shall follow the heat build procedure described in § 86.133 by not more than one hour.

(vii) In performing exhaust sample analysis under § 86.140,

(A) When testing diesel vehicles, the manufacturer shall allow a minimum of 20 minutes warm-up for the HC analyzer, and a minimum of 2 hours warm-up for the CO, CO_2 and NO_x analyzers. [Power is normally left on infrared and chemiluminescent analyzers. When not in use, the chopper motors of the infrared analyzers are turned off and the phototube high voltage supply to the chemiluminescent analyzers is placed in the standby position.]

(B) The manufacturer shall exercise care to prevent moisture from condensing in the sample collection bags.

(viii) The manufacturer need not comply with § 86.142, since the records required therein are provided under other provisions of Subpart K of this part.

(ix) In addition to the requirements of Subpart B of this part, the manufacturer shall prepare gasoline-fueled vehicles as follows prior to exhaust emission testing:

(A) The manufacturer shall inspect the fuel system to insure the absence of any leaks of liquid or vapor to the atmosphere by applying a pressure of 14.5+0.5 inches of water to the fuel system, allowing the pressure to stabilize, and isolating the fuel system from the pressure source. Following isolation of the fuel system, pressure must not drop more than 2.0 inches of water in 5 minutes. If required the manufacturer shall perform corrective action in accordance with paragraph § 86.1008(d) and report this action in accordance with paragraph § 86.1009(d).

(B) When performing this pressure check, the manufacturer shall exercise care to neither purge nor load the evaporative emission control system.

(C) The manufacturer shall not modify the test vehicle's evaporative emission control system by component addition, deletion, or substitution, except to comply with paragraph (a)(4)(ii) of this section if approved in advance by the Administrator.

(5) The Administrator may, on the basis of a written application by a manufacturer, prescribe minor test procedure variations from those set forth in paragraphs (a)(1) and (a)(2) of this section for any heavy-duty engine.

(b)(1) The manufacturer shall not adjust, repair, prepare, or modify the engines or vehicles selected for testing and shall not perform any emission tests on engines or vehicles selected for testing pursuant to the test order unless this adjustment, repair, preparation, modification, and/or tests are documented in the manufacturer's engine or vehicle assembly and inspection procedures and are actually performed or unless these adjustments and/or tests are required or permitted under this subpart or are approved in advance by the Administrator.

(2) For 1984 and later model years the Administrator may adjust or cause to be adjusted any engine parameter which the Administrator has determined to be subject to adjustment for certification, Selective Enforcement Audit, and Production Compliance Audit testing in accordance with § 86.084-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.084-22(e)(3)(ii), prior to the performance of any tests. However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to any setting which causes a lower engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter if the manufacturer had accumulated 125 hours of service on the engine or 4,000 miles on the vehicle under paragraph (c) of this section, all other parameters being identically adjusted for the purpose of the comparison. The manufacturer may be requested to supply information to establish such an alternative minimum idle speed. The Administrator, in making or specifying these adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use heavy-duty engines or light-duty trucks. In determining likelihood, the Administrator may consider factors such as, but not limited to, the effect of the adjustment on engine or vehicle performance characteristics and surveillance information from similar in-use engines or vehicles.

(c) Prior to performing exhaust emission testing on an SEA test engine, the manufacturer may accumulate on each engine a number of hours of service equal to the greater of 125 hours or the number of hours the manufacturer accumulated during certification on the emission-data engine corresponding to the configuration specified in the test order. Prior to performing exhaust emission testing on an SEA test vehicle, the manufacturer may accumulate a number of miles equal to the greater of 4,000 miles or the number of miles the manufacturer accumulated during certification on the emission-data vehicle corresponding to the configuration specified in the test order.

(1) Service or mileage accumulation must be performed in any manner using good engineering judgment to obtain emission results representative of normal production vehicles. This service or mileage accumulation must be consistent with the new vehicle break-in instructions contained in the applicable vehicle owner's manual, if any.

(2) The manufacturer shall accumulate service at a minimum rate of 16 hours per engine or mileage at a minimum rate of 300 miles per vehicle during each 24-hour period, unless otherwise provided by the Administrator.

(i) The first 24 hour period for service or mileage accumulation shall begin as soon as authorized checks, inspections and preparations are completed on each engine or vehicle.

(ii) The minimum service or mileage accumulation rate does not apply on weekends or holidays.

(iii) If the manufacturer's service or mileage accumulation target is less than the minimum rate specified (16 hours or 300 miles per day), then the minimum daily accumulation rate shall be equal to the manufacturer's service or mileage accumulation target.

(3) Service or mileage accumulation shall be completed on a sufficient number of test engines or vehicles during consecutive 24-hour periods to assure that the number of engines or vehicles tested per day fulfills the requirements of paragraph (g) of this section.

(d) The manufacturer shall not perform any maintenance on test vehicles or engines after selection for testing, nor shall the Administrator allow deletion of any test vehicle or engine from the test sequence, unless requested by the manufacturer and approved by the Administrator before any test vehicle or engine maintenance or deletion.

(e) The manufacturer shall expeditiously ship test engines or vehicles from the point of selection to the test facility. If the test facility is not located at or in close proximity to the point of selection, the manufacturer shall assure that test engines or vehicles arrive at the test facility within 24 hours of selection: *Except*, That the Administrator may approve more time based upon a request by the manufacturer accompanied by a satisfactory justification.

(f) If an engine or vehicle cannot complete the service or mileage accumulation or emission test because of a malfunction, the manufacturer may request that the Administrator authorize the repair of that engine or vehicle or its deletion from the test sequence.

(g) Whenever a manufacturer conducts testing pursuant to a test order issued under this subpart, the manufacturer shall notify the Administrator within one working day of receipt of the test order which test facility will be used to comply with the test order. If no test cells are available at a desired facility, the manufacturer must provide alternate testing capability satisfactory to the Administrator.

(1) Heavy-duty engine manufacturers with projected sales for the United States market for that year of 30,000 or greater shall complete emission testing at their testing facility on a minimum of two engines per 24-hour period, including each voided test and each diesel engine smoke test.

(2) Heavy-duty engine manufacturers with projected sales for the United States market for that year of less than 30,000 shall complete emission testing at their testing facility on a minimum of one engine per 24-hour period, including each voided test and each diesel engine smoke test.

(3) Light-duty truck manufacturers shall complete emission testing on a minimum of four vehicles per 24-hour period, including each voided test.

(4) The Administrator may approve a lower daily rate of conducting emission tests based upon a request by a manufacturer accompanied by a satisfactory justification.

(h) The manufacturer shall perform test engine or vehicle selection, shipping, preparation, service or mileage accumulation, and testing in such a manner as to assure that the audit is performed in an expeditious manner.

(i) The manufacturer may retest any engines or vehicles tested during a Selective Enforcement Audit once a fail decision for the audit has been reached in accordance with § 86.1010-84(d) based on the first test on each engine or vehicle: *Except*, That the Administrator may approve retesting at other times based upon a request by the manufacturer accompanied by a satisfactory justification. The manufacturer may test each engine or vehicle a total of three times. The manufacturer shall test each engine or vehicle the same number of times. The manufacturer may accumulate additional service or mileage before conducting a retest, subject to the provisions of paragraph (c) of this section.

(Approved by the Office of Management and Budget under the control number 2060-0064)

[45 FR 63772, Sept. 25, 1980, as amended at 47 FR 49814, Nov. 2, 1982; 48 FR 52208, Nov. 16, 1983; 50 FR 35386, Aug. 30, 1985. Redesignated and amended at 54 FR 2124, Jan. 19, 1989]

§ 86.1008-90 Test procedures.

(a)(1) For heavy-duty engines, the prescribed test procedure is the Federal Test Procedure as described in Subparts N, I, and P of this part.

(2) For light-duty trucks, the prescribed test procedure is the Federal Test Procedure as described in Subparts B and F of this part. The manufacturer shall not perform the evaporative emission test procedure contained in Subpart B.

(3) When testing light-duty trucks the following exceptions to the test procedures in Subpart B are applicable:

(i) For mileage accumulation, the manufacturer may use test fuel meeting the specifications of mileage and service accumulation fuels of § 86.113. Otherwise, the manufacturer may use fuels other than those specified in this section only with the advance approval of the Administrator.

(ii) The manufacturer may measure the temperature of the test fuel at other than the approximate midvolume of the fuel tank, as specified in paragraph (a) of § 86.131-90, and may drain the test fuel from other than the lowest point of the fuel tank, as specified in paragraph (b) of § 86.131-90, provided an equivalent method is used. Equivalency documentation shall be maintained by the manufacturer and shall be made available to the Administrator upon request.

(iii) The manufacturer may perform additional preconditioning on SEA test vehicles other than the preconditioning specified in § 86.132 only if the additional preconditioning had been performed on certification test vehicles of the same configuration.

(iv) The manufacturer shall perform the heat build procedure 11 to 34 hours following vehicle preconditioning rather than according to the time period specified in paragraph (a) of § 86.133. All references in § 86.133 to an evaporative emission enclosure (SHED) and analyzing for HC during the heat build can be ignored.

(v) The manufacturer may substitute slave tires for the drive wheel tires on the vehicle as specified in paragraph (e) of § 86.135-90: *Provided*, that the slave tires are the same size.

(vi) The cold start exhaust emission test described in § 86.137 shall follow the heat build procedure described in § 86.133 by not more than one hour.

(vii) In performing exhaust sample analysis under § 86.140.

(A) When testing diesel vehicles or methanol-fueled vehicles, the manufacturer shall allow a minimum of 20 minutes warm-up for the HC analyzer, and a minimum of 2 hours warm-up for the CO, CO_2 and NOx analyzers. (Power is normally left on infrared and chemiluminescent analyzers. When not in use, the chopper motors of the infrared analyzers are turned off and the phototube high voltage supply to the chemiluminescent analyzers is placed in the standby position.)

(B) The manufacturer shall exercise care to prevent moisture from condensing in the sample collection bags.

(viii) The manufacturer need not comply with § 86.142, since the records required therein are provided under other provisions of Subpart K of this part.

(ix) In addition to the requirements of Subpart B of this part, the manufacturer shall prepare gasoline-fueled vehicles and methanol-fueled vehicles as follows prior to exhaust emission testing:

(A) The manufacturer shall inspect the fuel system to insure the absence of any leaks of liquid or vapor to the atmosphere by applying a pressure of 14.5+0.5 inches of water to the fuel system, allowing the pressure to stabilize, and isolating the fuel system from the pressure source. Following isolation of the fuel system, pressure must not drop more than 2.0 inches of water in five minutes. If required, the manufacturer shall perform corrective action in accordance with § 86.1008 and report this action in accordance with § 86.1009.

(B) When performing this pressure check, the manufacturer shall exercise care to neither purge nor load the evaporative emission control system.

(C) The manufacturer shall not modify the test vehicle's evaporative emission control system by component addition, deletion, or substitution, except to comply with paragraph (a)(4)(ii) of this section if approved in advance by the Administrator.

(4) The Administrator, may on the basis of a written application by a manufacturer, prescribe minor test

procedure variations from those set forth in paragraphs (a)(1) and (a)(2) of this section for any heavy-duty engine.

(b)(1) The manufacturer shall not adjust, repair, prepare, or modify the engines or vehicles selected for testing and shall not perform any emission tests on engines or vehicles selected for testing and shall not perform any emission tests on engines or vehicles selected for testing pursuant to the test order unless this adjustment, repair, preparation, modification, and/or tests are documented in the manufacturer's engine or vehicle assembly and inspection procedures and are actually performed or unless these adjustments and/or test are required or permitted under this subpart or are approved in advance by the Administrator.

(2) For 1984 and later model years the Administrator may adjust or cause to be adjusted any engine parameter which the Administrator has determined to be subject to adjustment for certification, Selective Enforcement Audit, and Production Compliance Audit testing in accordance with § 86.090-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.090-22(e)(3)(ii), prior to the performance of any tests. However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to any setting which causes a lower engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter if the manufacturer had accumulated 125 hours of service on the engine or 4,000 miles on the vehicle under paragraph (c) of this section, all other parameters being identically adjusted for the purpose of the comparison. The manufacturer may be requested to supply information to establish such an alternative minimum idle speed. The Administrator, in making or specifying these adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use heavy-duty engines or light-duty trucks. In determining likelihood, the Administrator may consider factors such as, but not limited to, the effect of the adjustment on engine or vehicle performance characteristics and surveillance information from similar in-use engines or vehicles.

(c) Prior to performing exhaust emission testing on an SEA test engine, the manufacturer may accumulate on each engine a number of hours of service equal to the greater of 125 hours or the number of hours the manufacturer accumulated during certification on the emission-data engine corresponding to the configuration specified in the test order. Prior to performing exhaust emission testing on an SEA test vehicle, the manufacturer may accumulate a number of miles equal to the greater of 4,000 miles or the number of miles the manufacturer accumulated during certification on the emission data vehicle corresponding to the configuration specified in the test order.

(1) Service or mileage accumulation must be performed in a manner using good engineering judgment to obtain emission results representative of normal production vehicles. This service or mileage accumulation must be consistent with the new vehicle break-in instructions contained in the applicable vehicle owner's manual, if any.

(2) The manufacturer shall accumulate service at a minimum rate of 16 hours per engine or mileage at a minimum rate of 300 miles per vehicle during each 24-hour period, unless otherwise provided by the Administrator.

(i) The first 24 hour period for service or mileage accumulation shall begin as soon as authorization checks, inspections and preparations are completed on each engine or vehicle.

(ii) The minimum service or mileage accumulation rate does not apply on weekends or holidays.

(iii) If the manufacturer's service or mileage accumulation target is less than the minimum rate specified (16 hours or 300 miles per day), then the minimum daily accumulation rate shall be equal to the manufacturer's service or mileage accumulation target.

(3) Service or mileage accumulation shall be completed on a sufficient number of test engines or vehicles during consecutive 24-hour periods to assure that the number of engines or vehicles tested per day fulfills the requirements of paragraph (g) of this section.

(d) The manufacturer shall not perform any maintenance on test vehicles or engines after selection for testing, nor shall the Administrator allow deletion of any test vehicle or engine from the test sequence, unless requested by the manufacturer, and approved by the Administrator before any test vehicle or engine maintenance or deletion.

(e) The manufacturer shall expeditiously ship test engines or vehicles from the point of selection to the test facility. If the test facility is not located at or in close proximity to the point of selection, the manufacturer shall assure that test engines or vehicles arrive at the test facility within 24 hours of selection: *Except*, that the Administrator may approve more time based upon a request by the manufacturer accompanied by a satisfactory justification.

(f) If an engine or vehicle cannot complete the service or mileage accumulation or emission test because of a malfunction, the manufacturer may request that the Administrator authorize the repair of that engine or vehicle or its deletion from the test sequence.

(g) Whenever a manufacturer conducts testing pursuant to a test order issued under this subpart, the manufacturer shall notify the Administrator within one working day of receipt of the test order which test facility will be used to comply with the test order. If no test cells are available at a desired facility, the manufacturer must provide alternate testing capability satisfactory to the Administrator.

(1) Heavy-duty engine manufacturers with projected sales for the United States market for that year of 30,000 or greater shall complete emission testing at their facility on a minimum of two engines per 24-hour period, including each voided test and each diesel engine smoke test.

(2) Heavy-duty engine manufacturers with projected sales for the United States market for that year of less than 30,000 shall complete emission testing at their facility on a minimum of one engine per 24-hour period, including each voided test and each diesel engine smoke test.

(3) Light-duty truck manufacturers shall complete emission testing at their facility on a minimum of four engines per 24-hour period, including each voided test.

(4) The Administrator may approve a lower daily rate of conducting emission tests based upon a request by a satisfactory justification.

(h) The manufacturer shall perform test engine or vehicle selection, shipping, preparation, service or mileage accumulation, and testing in such a manner as to assure that the audit is performed in an expeditious manner.

(i) The manufacturer may retest any engines or vehicles tested during a Selective Enforcement Audit once a fail decision for the audit has been reached in accordance with § 86.1010-84(d) based on the first test on each engine or vehicle: *Except*, that the Administrator may approve retesting at other times based upon a request by the manufacturer accompanied by a satisfactory justification. The manufacturer may test each engine or vehicle a total of three times. The manufacturer shall test each engine or vehicle the same number of times. The manufacturer may accumulate additional service or mileage before conducting a retest, subject to the provisions of paragraph (c) of this section.

[54 FR 14560, Apr. 11, 1989]

§ 86.1009-84 Calculation and reporting of test results.

(a) Initial test results are calculated following the Federal Test Procedure specified in paragraph (a) of § 86.1008-84. Round these results, in accordance with ASTM E29-67, to the number of decimal places contained in the applicable emission standard expressed to one additional significant figure.

(b) Final test results are calculated by summing the initial test results derived in paragraph (a) of this section for each test engine or vehicle, dividing by the number of test conducted on the engine or vehicle, and rounding in accordance with ASTM E29-67 to the same number of decimal places contained in the applicable standard expressed to one additional significant figure.

(c) *Final deteriorated test results.* (1) The final deteriorated test results for each heavy-duty engine or light-duty truck tested according to Subpart B, D, N, or P of this part are calculated by multiplying the final test results by the appropriate deterioration factor, derived from the certification process for the engine family-control system combination and model year for the selected configuration to which the test engine or vehicle belongs. If the deterioration factor computed during the certification process is less than one, that deterioration factor will be one.

(2) The final deteriorated test results for each heavy-duty engine tested according to Subpart I of this part are calculated by adding the appropriate deterioration factor, derived from the certification process for the engine family-control system combination and model year for the selected configuration to which the test engine belongs, to the final test results. If the deterioration factor computed during the certification process is less than zero, that deterioration factor will be zero.

(3) The final deteriorated test results are rounded to the same number of significant figures contained in the applicable standard in accordance with ASTM E29-67.

(d) Within five working days after completion of testing of all engines or vehicles pursuant to a test order, the manufacturer shall submit to the Administrator a report which includes the following information:

(1) The location and description of the manufacturer's exhaust emission test facilities which were utilized to conduct testing reported pursuant to this section;

(2) The applicable standards or compliance levels against which the engines or vehicles were tested;

(3) Deterioration factors for the engine family to which the selected configuration belongs;

(4) A description of the engine or vehicle and any emission-related component selection method used;

(5) For each test conducted,

(i) Test engine or vehicle description, including:

(A) Configuration and engine family identification,

(B) Year, make and build date,

(C) Engine or vehicle identification number, and

(D) Number of hours of service accumulated on engine or number of miles on vehicle prior to testing;

(ii) Location where service or mileage accumulation was conducted and description of accumulation procedure and schedule;

(iii) Test number, date, initial test results before and after rounding, final test results and final deteriorated test results for all exhaust emission tests, whether valid or invalid, and the reason for invalidation, if applicable;

(iv) A complete description of any modification, repair, preparation, maintenance, and/or testing which was performed on the test engine or vehicle and has not been reported pursuant to any other paragraph of this subpart and will not be performed on all other production engines or vehicles;

(v) Where an engine or vehicle was deleted from the test sequence by authorization of the Administrator, the reason for the deletion;

(vi) For all valid and invalid exhaust emission tests, carbon dioxide emission values for LDTs and brake-specific fuel consumption values for HDEs; and

(vii) Any other information the Administrator may request relevant to the determination as to whether the new heavy-duty engines or light-duty trucks being manufactured by the manufacturer do in fact conform with the regulations with respect to which the certificate of conformity was issued; and

(6) The following statement and endorsement:

> This report is submitted pursuant to Sections 206 and 208 of the Clean Air Act. This Selective Enforcement Audit was conducted in complete conformance with all applicable regulations under 40 CFR Part 86 *et seq.* and the conditions of the test order. No

emission-related changes to production processes or quality control procedures for the vehicle or engine configuration tested have been made between receipt of the test order and conclusion of the audit. All data and information reported herein is, to the best of

(Company Name) ————————

knowledge, true and accurate. I am aware of the penalties associated with violations of the Clean Air Act and the regulations thereunder.

————————————

(Authorized Company Representative)

[45 FR 63772, Sept. 25, 1980, as amended at 48 FR 52209, Nov. 16, 1983; 50 FR 35387, Aug. 30, 1985]

§ 86.1010–84 Compliance with acceptable quality level and passing and failing criteria for selective enforcement audits.

(a) The prescribed acceptable quality level is 40 percent.

(b) A failed engine or vehicle is one whose final deteriorated test results pursuant to § 86.1009–84(c), for one or more of the applicable exhaust pollutants, exceed the applicable emission standard or compliance level.

(c) The manufacturer shall test heavy-duty engines or light-duty trucks comprising the test sample until a pass decision is reached for all pollutants, or a fail decision is reached for one pollutant. A pass decision is reached when the cumulative number of failed engines or vehicles, as defined in paragraph (b) of this section, for each pollutant is less than or equal to the past decision number appropriate to the cumulative number of engines or vehicles tested. A fail decision is reached when the cumulative number of failed engines or vehicles for one or more pollutants is greater than or equal to the fail decision number appropriate to the cumulative number of engines or vehicles tested. The pass and fail decision numbers associated with the cumulative number of engines or vehicles tested are determined by using the tables in Appendix X of this part appropriate to the projected sales as made by the heavy-duty engine manufacturer in its Application for Certification or as made by the light-duty truck manufacturer in its report submitted under paragraph (a)(2) of § 600.207–80 of the Automobile Fuel Economy Regulations. In the tables in Appendix X to this part, sampling plan "stage" refers to the cumulative number of engines or vehicles tested. Once a pass or fail decision has been made for a particular pollutant, the number of engines or vehicles whose final deteriorated test results exceed the emission standard or compliance level, if applicable, for that pollutant shall not be considered any further for the purposes of the audit.

(d) Passing or failing of an SEA occurs when the decision is made on the last engine or vehicle required to make a decision under paragraph (c) of this section.

(e) The Administrator may terminate testing earlier than required in paragraph (c) of this section.

[45 FR 63772, Sept. 25, 1980, as amended at 48 FR 1414, Jan. 12, 1983; 48 FR 52209, Nov. 16, 1983; 50 FR 35387, Aug. 30, 1985]

§ 86.1012–84 Suspension and revocation of certificates of conformity.

(a) The certificate of conformity is suspended with respect to any engine or vehicle failing pursuant to paragraph (b) of § 86.1010–84 effective from the time that testing of that engine or vehicle is completed.

(b) The Administrator may suspend the certificate of conformity for a configuration which does not pass an SEA, pursuant to paragraph § 86.1010–84(c), based on the first test or all tests conducted on each engine or vehicle. This suspension will not occur before ten days after failure to pass the audit.

(c)—(d) [Reserved]

(e) If the results of testing pursuant to these regulations indicate that engines or vehicles of a particular configuration produced at one plant of a manufacturer do not conform to the regulations with respect to which the certificate of conformity was issued, the Administrator may suspend the certificate of conformity with respect to that configuration for engines or vehicles manufactured by the manufacturer at all other plants.

(f) [Reserved]

(g) The Administrator shall notify the manufacturer in writing of any suspension or revocation of a certificate of conformity in whole or in part: *Except,* That the certificate is immediately suspended with respect to any failed engines or vehicles as provided for in paragraph (a) of this section.

(h) The Administrator may revoke a certificate of conformity for a configuration when the certificate has been suspended pursuant to paragraph (b), (c) or (e) of this section if the proposed remedy for the nonconformity, as reported by the manufacturer to the Administrator, is one requiring a design change or changes to the engine and/or emission control system as described in the Application for Certification of the affected configuration.

(i) Once a certificate has been suspended for a failed engine or vehicle as provided for in paragraph (a) of this section, the manufacturer shall take the following actions:

(1) Before the certificate is reinstated for that failed engine or vehicle,

(i) Remedy the nonconformity, and

(ii) Demonstrate that the engine or vehicle conforms to applicable standards or compliance levels by retesting the engine or vehicle in accordance with these regulations; and

(2) Submit a written report to the Administrator, after successful completion of testing on the failed engine or vehicle, which contains a description of the remedy and test results for each engine or vehicle in addition to other information that may be required by this regulation.

(j) Once a certificate for a failed configuration has been suspended pursuant to paragraph (b), (c) or (e) of this section, the manufacturer shall take the following actions before the Administrator will consider reinstating the certificate:

(1) Submit a written report to the Administrator which identifies the reason for the noncompliance of the engines or vehicles, describes the proposed remedy, including a description of any proposed quality control and/or quality assurance measures to be taken by the manufacturer to prevent future occurrences of the problem, and states the date on which the remedies will be implemented; and

(2) Demonstrate that the engine or vehicle configuration for which the certificate of conformity has been suspended does in fact comply with these regulations by testing engines or vehicles selected from normal production runs of that engine or vehicle configuration, at the plant(s) or associated storage facilities specified by the Administrator, in accordance with the conditions specified in the initial test order. If the manufacturer elects to continue testing individual engines or vehicles after suspension of a certificate, the certificate is reinstated for any engine or vehicle actually determined to be in conformance with the applicable standards or compliance levels through testing in accordance with the applicable test procedures, provided that the Administrator has not revoked the certificate pursuant to paragraph (h) of this section.

(k) Once the certificate has been revoked for a configuration and the manufacturer desires to continue introduction into commerce of a modified version of that configuration, the following actions shall be taken before the Administrator may consider issuing a certificate for that modified configuration:

(1) If the Administrator determines that the proposed change(s) in engine or vehicle design may have an effect on emission performance deterioration or, in the case of light-duty trucks, on fuel economy, the Administrator shall notify the manufacturer, within five (5) working days after receipt of the report in paragraph (h) of this section, whether subsequent testing under this subpart will be sufficient to evaluate the proposed change or changes or whether additional testing will be required; and

(2) After implementing the change or changes intended to remedy the nonconformity, the manufacturer shall demonstrate that the modified engine or vehicle configuration does in fact conform with these regulations by testing engines or vehicles selected from normal production runs of that modified engine or vehicle configuration in accordance with the conditions specified in the initial test order. This testing will be considered by the Administrator to satisfy the testing re-

quirements of § 86.078-32 or § 86.079-33 if the Administrator has so notifed the manufacturer. If the subsequent audit results in passing of the audit at the level of the standards or compliance levels, if applicable, the Administrator shall reissue or amend the certificate, as the case may be, to include that configuration, provided that the manufacturer has satisfied the testing requirements of paragraph (k)(1) of this section. If the subsequent audit is failed, the revocation remains in effect. Any design change approvals under this subpart are limited to the configuration affected by the test order.

(l) At any time subsequent to an initial suspension of a certificate of conformity for a test engine or vehicle pursuant to paragraph (a) of this section, but not later than fifteen (15) days or such other period as may be allowed by the Administrator after notification of the Administrator's decision to suspend or revoke a certificate of conformity in whole or in part pursuant to paragraphs (b), (c), (d), (e), or (h) of this section, a manufacturer may request a hearing as to whether the tests have been properly conducted or any sampling methods have been properly applied.

(m) After the Administrator suspends or revokes a certificate of conformity pursuant to this section or notifies a manufacturer of his intent to suspend, revoke or void a certificate of conformity under paragraph § 86.087-30(e), and prior to the commencement of a hearing under § 86.1014-84, if the manufacturer demonstrates to the Administrator's satisfaction that the decision to suspend, revoke or void the certificate was based on erroneous information, the Administrator shall reinstate the certificate.

(n) To permit a manufacturer to avoid storing non-test engines or vehicles when conducting an audit of a configuration subsequent to suspension or revocation of the certificate of conformity for that configuration resulting from failure of an SEA, it may request that the Administrator conditionally reinstate the certificate for that configuration. The Administrator may reinstate the certificate subject to the condition that the manufacturer consents to recall all engines or vehicles of that configuration produced from the time the certificate is conditionally reinstated if the configuration fails the subsequent audit at the level of the standard and to remedy any nonconformity at no expense to the owner.

[45 FR 63772, Sept. 25, 1980, as amended at 48 FR 52209, Nov. 16, 1983; 50 FR 35387, Aug. 30, 1985]

§ 86.1014-84 Hearings on suspension, revocation and voiding of certificate of conformity.

(a) *Applicability.* The procedures prescribed by this section apply whenever a manufacturer requests a hearing pursuant to § 86.087-30 (e)(6)(i), § 86.087-30(e)(7), or § 86.1012-84(1).

(b) *Definitions.* The following definitions are applicable to this section:

(1) "Hearing Clerk" shall mean the Hearing Clerk of the Environmental Protection Agency.

(2) "Manufacturer" means a manufacturer contesting a suspension or revocation order directed at the manufacturer.

(3) "Party" means the Agency and the manufacturer.

(4) "Presiding Officer" means an Administrative Law Judge appointed pursuant to 5 U.S.C. 3105 (see also 5 CFR Part 930 as amended).

(5) "Judicial Officer" means an officer or employee of the Agency appointed as a Judicial Officer by the Administrator pursuant to this section who shall meet the qualifications and perform functions as follows:

(i) Officer—there may be designated for the purposes of this section one or more Judicial Officers. As work requires, there may be a Judicial Officer designated to act for the purposes of a particular case.

(ii) Qualifications—a Judicial Officer may be a permanent or temporary employee of the Agency who performs other duties for the Agency. The Judicial Officer shall not be employed by the Office of Enforcement or have any connection with the preparation or presentation of evidence for a hearing held pursuant to this subpart. The Judicial Officer shall be a graduate of an accredited law school and a member in good standing of a recognized Bar Association of any state or the District of Columbia.

(iii) Functions—the Administrator may consult with Judicial Officer or delegate all or part of his authority to act in a given case under this section to a Judicial Officer: *Provided,* That this delegation does not preclude the Judicial Officer from referring any motion or case to the Administrator when the Judicial Officer determines such referral to be appropriate.

(c) *Request for public hearing.* (1) If the manufacturer disagrees with the Administrator's decision to suspend, revoke or void a certificate or disputes the basis for an automatic suspension pursuant to § 86.1012-84(a), the manufacturer may request a public hearing as described in this section. The manufacturer shall file with the Administrator a request for this hearing not later than fifteen (15) days after the Administrator's notification of his decision to suspend or revoke unless otherwise specified by the Administrator. The manufacturer shall simultaneously serve two copies of this request upon the Director of the Manufacturers Operations Division and file two copies with the Hearing Clerk. Failure of the manufacturer to request a hearing within the time provided constitutes a waiver of the right to a hearing. Subsequent to the expiration of the period for requesting a hearing as of right, the Administrator may, in his discretion and for good cause shown, grant the manufacturer a hearing to contest the suspension or revocation.

(2) A manufacturer shall include in the request for a public hearing——

(i) A statement as to which engine or vehicle configuration is to be the subject of the hearing;

(ii) A concise statement of the issues to be raised by the manufacturer at the hearing: *Provided, however,* That in the case of the hearing requested under § 86.1012-84(1), the hearing is restricted to the following issues:

(A) Whether tests have been properly conducted, specifically, Whether the tests were conducted in accordance with applicable regulations under this part and whether test equipment was properly calibrated and functioning; and

(B) Whether sampling plans have been properly applied, specifically whether sampling procedures specified in Appendix X were followed and whether there exists a basis for distinguishing engines or vehicles produced at plants other than the one from which engines or vehicles were selected for testing which would invalidate the Administrator's decision under § 86.1012-84(e);

(iii) A statement specifying reasons why the manufacturer believes it will prevail on the merits of each of the issues raised; and

(iv) A summary of the evidence which supports the manufacturer's position on each of the issues raised.

(3) A copy of all requests for public hearings will be kept on file in the Office of the Hearing Clerk and will be made available to the public during Agency business hours.

(d) *Summary decision.* (1) In the case of a hearing requested under § 86.1012-84(1), when it clearly appears from the data and other information contained in the request for a hearing that there is no genuine and substantial question of fact with respect to the issues specified in § 86.1014-84(c)(2)(ii), the Administrator shall enter an order denying the request for a hearing and reaffirming the original decision to suspend or revoke a certificate of conformity, if this decision has been made pursuant to § 86.1012-84(g) at any time prior to the decision to deny the request for a hearing.

(2) In the case of a hearing requested under § 86.087-30(e)(6)(i), to challenge a proposed suspension of a certificate of conformity for the reasons specified in § 86.087-30(e)(1)(i) or (e)(1)(ii), when it clearly appears from the data and other information contained in the request for the hearing that there is no genuine and substantial question of fact with respect to the issue of whether the refusal to comply with the provisions of a test order or any other requirement of § 86.1003-84 was caused by conditions and circumstances outside the control of the manufacturer, the Administrator shall enter an order denying the request for a hearing and suspending the certificate of conformity.

(3) Any order issued under paragraph (d) (1) or (2) of this section has the force and effect of a final decision of the Administrator, as issued pursuant to paragraph (w)(4) of this section.

(4) If the Administrator determines that a genuine and substantial question of fact does exist with respect to any of the issues referred to in paragraphs (d) (1) and (2) of this section, he shall grant the request for a hearing and publish a notice of public hearing in accordance with paragraph (h) of this section.

(e) *Filing and service.* (1) An original and two copies of all documents or papers required or permitted to be filed pursuant to this section must be filed with the Hearing Clerk. Filing is considered timely if mailed, as determined by the postmark, to the Hearing Clerk within the time allowed by this section. If filing is to be accomplished by mailing, the documents must be sent to the address set forth in the notice of public hearing as described in paragraph (h) of this section.

(2) To the maximum extent possible, testimony will be presented in written form. Copies of written testimony will be served upon all parties as soon as practicable prior to the start of the hearing. A certificate of service will be provided on or accompany each document or paper filed with the Hearing Clerk. Documents to be served upon the Director of the Manufacturers Operations Division must be sent by registered mail to:

Director, Manufacturers Operations Division, U.S. Environmental Protection Agency, EN-340, 401 M Street S.W., Washington, D.C. 20460.

Service by registered mail is complete upon mailing.

(f) *Time.* (1) In computing any period of time prescribed or allowed by this section, except as otherwise provided, the day of the act or event from which the designated period of time begins to run is not included. Saturdays, Sundays, and Federal legal holidays are included in computing the period allowed for the filing of any document or paper, except that when the period expires on a Saturday, Sunday, or Federal legal holiday, the period is extended to include the next following business day.

(2) A prescribed period of time within which a party is required or permitted to do an act is computed from the time of service, except that when service is accomplished by mail, three days will be added to the prescribed period.

(g) *Consolidation.* The Administrator or the Presiding Officer in his discretion may consolidate two or more proceedings to be held under this section for the purpose of resolving one or more issues whenever it appears that consolidation will expedite or simplify consideration of these issues. Consolidation does not affect the right of any party to raise issues that could have been raised if consolidation had not occurred.

(h) *Notice of public hearings.* Notice of a public hearing under this section is given by publication in the FEDERAL REGISTER and by such other means as the Administrator finds appropriate to provide notice to the public. To the extent possible hearings under this section will be scheduled to commence within fourteen (14) days of receipt of the application in paragraph (c) of this section.

(i) *Amicus curiae.* Persons not parties to the proceeding wishing to file briefs may do so by leave of the Presiding Officer granted on motion. A motion for leave must identify the interest of the applicant and state the reasons why the proposed amicus brief is desirable.

(j) *Presiding Officer.* The Presiding Officer shall conduct a fair and impartial hearing in accordance with 5 U.S.C. sections 554, 556 and 557 and take all necessary action to avoid delay in the disposition of the proceedings and to maintain order. He shall have all power consistent with Agency rule and with the Administrative Procedure Act necessary to this end, including the power:

(1) To administer oaths and affirmations;

(2) To rule upon offers of proof and exclude irrelevant or repetitious material;

(3) To regulate the course of the hearings and the conduct of the parties and their counsel therein;

(4) To hold conferences for simplification of the issues or any other proper purpose;

(5) To consider and rule upon all procedural and other motions appropriate to these proceedings;

(6) To require the submission of direct testimony in written form with or without affidavit whenever, in his opinion, oral testimony is not necessary for full and true disclosure of the facts;

(7) To enforce agreements and orders requiring access as authorized by law;

(8) To require the filing of briefs on any matter on which he is required to rule;

(9) To require any party or any witness, during the course of the hearing, to state his position on any issue;

(10) To take or cause depositions to be taken whenever the ends of justice would be served thereby;

(11) To make decisions or recommend decisions to resolve the disputed issues on the record of the hearing; and

(12) To issue, upon good cause shown, protective orders as described in paragraph (n) of this section.

(k) *Conferences.* (1) The Presiding Officer may hold conferences prior to or during any hearing. The Presiding Officer shall direct the Hearing Clerk to notify all parties of the time and location of any conference. At the discretion of the Presiding Officer, persons other than parties may attend. At a conference the Presiding Officer may:

(i) Obtain stipulations and admissions, receive requests, order depositions to be taken, identify disputed issues of fact and law, and require or allow the submission of written testimony from any witness or party;

(ii) Set a hearing schedule for as many of the following as he considers necessary:

(A) Oral and written statements;

(B) Submission of written direct testimony as required or authorized by the Presiding Officer;

(C) Oral direct and cross-examination of a witness where necessary as prescribed in paragraph (p) of this section; and

(D) Oral argument, if appropriate;

(iii) Identify matters of which official notice may be taken;

(iv) Consider limitation of the number of expert and other witnesses;

(v) Consider the procedure to be followed at the hearing; and

(vi) Consider any other matter that may expedite the hearing or aid in the disposition of the issue.

(2) The Presiding Officer shall summarize in writing the results of any conference, including all stipulations if not transcribed, and shall make the summary part of the record.

(l) *Primary discovery (exchange of witness lists and documents).* (1) At a prehearing conference or within some reasonable time set by the Presiding Officer prior to the hearing, each party shall make available to the other parties the names of the expert and other witnesses the party expects to call, together with a brief summary of their expected testimony and a list of all documents and exhibits which the party expects to introduce into evidence. Thereafter, witnesses, documents, or exhibits may be added and summaries of expected testimony amended upon motion by a party.

(2) The Presiding Officer, may, upon motion by a party or other person, and for good cause shown, by order:

(i) Restrict or defer disclosure by a party of the name of a witness or a narrative summary of the expected testimony of a witness; and

(ii) Prescribe other appropriate measures to protect a witness.

(3) Any party affected by an action in paragraph (l)(2) of this section shall have an adequate opportunity, once he learns the name of a witness and obtains the narrative summary of his expected testimony, to prepare for the presentation of his case.

(m) *Other discovery.* (1) Except as provided by paragraph (m)(1) of this section, further discovery, under this paragraph is permitted only upon determination by the Presiding Officer.

(i) That this discovery will not in any way unreasonably delay the proceeding;

(ii) That the information to be obtained is not obtainable voluntarily; and

(iii) That the information has significant probative value. The Presiding

Officer shall be guided by the procedures set forth in the Federal Rules of Civil Procedure, where practicable, and the precedents thereunder, except that no discovery will be undertaken except upon order of the Presiding Officer or upon agreement of the parties.

(2) The Presiding Officer shall order depositions upon oral questions only upon a showing of good cause and upon a finding that:

(i) The information sought cannot be obtained by alternative methods; or

(ii) There is a substantial reason to believe that relevant and probative evidence may otherwise not be preserved for presentation by a witness at the hearing.

(3) Any party to the proceeding desiring an order of discovery shall make a motion or motions therefor. The motion must include:

(i) The circumstances warranting the taking of the discovery;

(ii) The nature of the information expected to be discovered; and

(iii) The proposed time and place where it will be taken. If the Presiding Officer determines the motion should be granted, he shall issue an order for the taking of the discovery together with the conditions and terms thereof.

(4) Failure to comply with an order issued pursuant to this paragraph may lead to the inference that the information to be discovered would be adverse to the person or party from whom the information was sought.

(n) *Protective orders, in camera proceedings.* (1) Upon motion by a part or by the person from whom discovery is sought, and upon a showing by the movant that the disclosure of the information to be discovered, or a particular part thereof (other than emission data), would result in methods or processes entitled to protection as trade secrets of the person being divulged, the Presiding Officer may enter a protective order with respect to this material. Any protective order will contain terms governing the treatment of the information which are appropriate under the circumstances to prevent disclosure outside the hearing: *Provided*, That the order states that the material will be filed separately from other evidence and exhibits in the hearing. Disclosure is limited to parties to the hearing, their counsel and relevant technical consultants, and authorized representatives of the United States concerned with carrying out the Act. Except in the case of the government, disclosure may be limited to counsel for parties who shall not disclose such information to the parties themselves. Except in the case of the government, disclosure to a party or his counsel is conditioned on execution of a sworn statement that no disclosure of the information will be made to persons not entitled to receive it under the terms of the protective order. (This provision is not necessary where government employees are concerned because disclosure by them is subject to the terms of 18 U.S.C. 1905.)

(2)(i) A party or person seeking a protective order may be permitted to make all or part of the required showing in camera. A record will be made of the in camera proceedings. If the Presiding Officer enters a protective order following a showing in camera, the record of the showing will be sealed and preserved and made available to the Agency or court in the event of appeal.

(ii) Attendance at any in camera proceeding may be limited to the Presiding Officer, the Agency, and the person or party seeking the protective order.

(3) Any party, subject to the terms and conditions of any protective order issues pursuant to paragraph (n)(1) of this section, desiring for the presentation of his case to make use of any in camera documents or testimony, shall make application to the Presiding Officer by motion setting forth the justification therefor. The Presiding Officer, in granting this motion, shall enter an order protecting the rights of the affected persons and parties and preventing unnecessary disclosure of this information, including the presentation of the information and oral testimony and cross-examination concerning it in executive session, as in his discretion is necessary and practicable.

(4) In the submittal of proposed findings, briefs, or other papers, counsel for all parties shall make a good faith attempt to refrain from disclosing the specific details of in camera

documents and testimony. This shall not preclude references in these proposed findings, briefs, or other papers to the documents or testimony, including generalized statements based on their contents. To the extent that counsel considers it necessary to include specific details in their presentations, these details will be incorporated in separate proposed findings, briefs, or other paper marked "confidential", and wil become part of the in camera record.

(o) *Motions.* (1) All motions, except those made orally during the course of the hearing, must be in writing and state with particularity the grounds therefor, set forth the relief or order sought, and be filed with the Hearing Clerk and served upon all parties.

(2) Within the time fixed by the Administrator, the judicial officer, or the Presiding Officer, as appropriate, any party may serve and file an answer to the motion. The movant shall, if requested by the Administrator, the judicial officer, or the Presiding Officer, as appropriate, serve and file reply papers, within the time set by the request.

(3) The Presiding Officer shall rule upon all motions filed or made prior to the filing of his decision or accelerated decision, as appropriate. The Administrator or the judicial officer, as appropriate, shall rule upon all motions filed prior to the appointment of a Presiding Officer and all motions filed after the filing of the decision of the Presiding Officer or accelerated decision. Oral argument of motions will be permitted only if the Presiding Officer, the Administrator or the judicial officer, as appropriate, considers it necessary.

(p) *Evidence.* (1) The official transcripts and exhibits, together with all papers and requests filed in the proceeding, consitute the record. Immaterial or irrelevant part of an admissible document will be segregated and excluded so far as practicable. Documents or parts thereof subject to a protective order under pargarph (n) of this section wil be segregated. Evidence may be received at the hearing even though inadmissible under the rules of evidence applicable to judicial proceedings. The weight to be given evidence will be determined by its reliability and probative value.

(2) The Presiding Officer shall allow the parties to examine and cross-examine a witness to the extent that this examination and cross-examination is necessary for a full and true disclosure of the facts.

(3) Ruling of the Presiding Officer on the admissibility of evidence, the propriety of examination and cross-examination, and other procedural matters will appear in the record.

(4) Parties shall automatically be presumed to have taken exception to an adverse ruling.

(q) *Record.* (1) Hearings will be stenographically reported and transcribed and the original transcripts will be part of the record and the sole official transcript. Copies of the record will be filed with the Hearing Clerk and made available during Agency business hours for public inspection. Any thereof, except as provided in paragraph (n) of this section, shall be entitled to the same upon payment of the cost thereof.

(2) The official transcripts and exhibits, together with all paper and requests filed in the proceeding, constitute the record.

(r) *Proposed findings, conclusions.* (1) Within four (4) days of the close of the reception of evidence, or within such longer time as the Presiding Officer may fix, any party may submit for the consideration of the Presiding Officer proposed findings of fact, conclusions of law, and proposed order, together with reasons therefor and briefs in support thereof. These proposals will be in writing, be served upon all parties, and contain adequate references to the record and authorities relied upon.

(2) The record will show the Presiding Officer's ruling on the proposed findings and conclusions except when his order disposing of the proceeding otherwise informs the parties of the action taken by him thereon.

(s) *Decision of the Presiding Officer.* (1) Unless extended by the Administrator, the Presiding Officer shall issue and file with the Hearing Clerk his decision within fourteen (14) days (or within seven (7) days in the case of a hearing requested under § 86.1012-

84(l)) after the period for filing proposed findings as provided for in paragraph for in paragraph (r) of this section has expired.

(2) The Presiding Officer's decision becomes the decision of the Administrator:

(i) When no notice of intention to appeal as described in paragraph (t) and (u) of this section is filed, ten (10) days after issuance thereof, unless in the interim the Administrator shall have acted to review or stay the effective date of the decision; or

(ii) When a notice of intention to appeal is filed but the appeal is not perfected as required by paragraph (t) or (u) of this section, five (5) days after the period allowed for perfection of an appeal has expired unless within that five (5) day period, the Administrator shall have acted to review or stay the effective date of the decision.

(3) The Presiding Officer's decision must include a statement of findings and conclusions, as well as the reasons or basis therefor, upon all the material issues of fact or law presented on the record and an appropriate rule or order. The decision must be supported by substantial evidence and based upon a consideration of the whole record.

(4) At any time prior to the issuance of his decision, the Presiding Officer may reopen the proceeding for the reception of further evidence. Except for the correction of clerical errors, the jurisdiction of the Presiding Officer is terminated upon the issuance of his decision.

(t) *Appeal from the decision of the Presiding Officer.* (1) Any party to a proceeding may appeal the Presiding Officer's decision to the Administrator: *Provided,* That within ten (10) days after issuance of the Presiding Officer's decision the party files a notice of intention to appeal and an appeal brief within twenty (20) days of the decision.

(2) When an appeal is taken from the decision of the Presiding Officer, any party may file a brief with respect to the appeal. The party shall file the brief within fifteen (15) days of the date of the filing of the appellant's brief.

(3) Any brief filed pursuant to this paragraph will contain, in the order indicated, the following:

(i) A subject index of the matter in the brief, with page references, and a table of cases (alphabetically arranged), textbooks, statutes, and other material cited, with page references thereto:

(ii) A specification of the issues intended to be urged; provided, however, that in the case of a hearing requested under § 86.1012-84(l), the brief will be restricted to the issues specified in paragraph (c)(2)(ii) of this section;

(iii) The argument presenting clearly the points of fact and law relied upon in support of the position taken on each issue, with specific page references to the record and the legal or other material relied upon; and

(iv) A proposed order for the Administrator's consideration if different from the order contained in the Presiding Officer's decision.

(4) No brief in excess of 40 pages will be filed without leave of the Administrator.

(5) The Administrator may allow oral argument.

(u) *Summary appeal.* (1) In the case of a hearing requested under § 86.1012-84(l), any appeal taken from the decision of the Presiding Officer will be conducted under this subsection.

(2) Any party to the proceeding may appeal the Presiding Officer's decision to the Administrator by filing a notice of appeal within ten (10) days.

(3) The notice of appeal must be in the form of a brief and conform to the requirements of paragraph (t)(3) of this section.

(4) Within ten (10) days after a notice of appeal from the decision of the Presiding Officer is filed under this paragraph, any party may file a brief with respect to that appeal.

(5) No brief in excess of fifteen (15) pages will be filed without leave of the Administrator.

(v) *Review of the Presiding Officer's decision in the absence of appeal.* (1) If, after the expiration of the period for taking appeal as provided for by paragraph (t) or (u) of this section, no notice of intention to appeal the decision of the Presiding Officer has been filed, or if filed, not perfected, the Hearing Clerk shall so notify the Administrator.

(2) The Administrator, upon receipt of notice from the Hearing Clerk that no notice of intention to appeal has been filed, or if filed, not perfected pursuant to paragraph (t) or (u) of this section, may, on his own motion, within the time limits specified in paragraph (s)(2) of this section, review the decision of the Presiding Officer. Notice of the intention of the Administrator to review the decision of the Presiding Officer will be given to all parties and will set forth the scope of the review and the issues to be considered and will make provision for filing of briefs.

(w) *Decision of appeal or review.* (1) Upon appeal from or review of the Presiding Officer's decision, the Administrator shall consider such parts of the record as are cited or as may be necessary to resolve the issues presented and in addition shall, to the extent necessary or desirable, exercise all the powers which he could have exercised if he had presided at the hearing.

(2) In rendering his decision, the Administrator shall adopt, modify or set aside the findings, conclusions, and order contained in the decision of the Presiding Officer and shall set forth in his decision a statement of the reasons or basis for his action.

(3) In those cases where the Administrator believes that he should have further information or additional views of the parties as to the form and content of the rule or order to be issued, the Administrator, in his discretion, may withhold final action pending the receipt of the additional information or views, or may remand the case to the Presiding Officer.

(4) Any decision rendered under this paragraph which completes disposition of a case constitutes a final decision of the Administrator.

(x) *Reconsideration.* (1) Within twenty (20) days after issuance of the Administrator's decision, any party may file with the Administrator a petition for reconsideration of this decision, setting forth the relief desired and the grounds in support thereof. Any petition filed under this subsection must be confined to new questions raised by the decision or final order and upon which the petitioner had no opportunity to argue before the Presiding Officer or the Administrator: *Provided, however,* That in the case of a hearing requested under § 86.1012-84(l) these questions will be limited to the issues specified in paragraph (c)(2)(ii) of this section.

(2) Any party desiring to oppose this petition shall file an answer thereto within ten (10) days after the filing of the petition. The filing of a petition for reconsideration does not operate to stay the effective date of the decision or order or to toll the running of any statutory time period affecting the decision or order unless specifically so ordered by the Administrator.

(y) *Accelerated decision, dismissal.* (1) The Presiding Officer, upon motion of any party or sua sponte, may at any time render an accelerated decision in favor of the Agency or the manufacturer as to all or any part of the proceeding, without further hearing or upon limited additional evidence such as affidavits which he may require, or dismiss any party with prejudice, for any of the following reasons:

(i) Failure to state a claim upon which relief can be granted, or direct or collateral estoppel;

(ii) The lack of any genuine issue of material fact, causing a party to be entitled to judgment as a matter of law; or

(iii) Such other reasons as are just, including specifically failure to obey a procedural order of the Presiding Officer.

(2) If, under this subsection, an accelerated decision is issued as to all the issues and claims joined in the proceeding, the decision will be treated for the purposes of these procedures as the decision of the Presiding Officer as provided in paragraph (s) of this section.

(3) If, under this subsection, judgment is rendered on less than all issues or claims in the proceeding, the Presiding Officer shall determine what material facts exist without substantial controversy and what material facts are actually and in good faith controverted. He shall thereupon issue an order specifying the facts which

appear without substantial controversy, and the issues and claims upon which the hearing will proceed.

(z) *Conclusion of hearing.* (1) If, after the expiration of the period for taking an appeal as provided for by paragraphs (t) and (u) of this section, no appeal has been taken from the Presiding Officer's decision, and after the expiration of the period for review by the Administrator on his own motion as provided for by paragraph (v) of this section, the Administrator does not move to review the decision, the hearing is considered ended at the expiration of all periods allowed for the appeal and review.

(2) If an appeal of the Presiding Officer's decision is taken pursuant to paragraphs (t) and (u) of this section, or if, in the absence of this appeal, the Administrator moves to review the decision of the Presiding Officer pursuant to paragraph (v) of this section, the hearing is considered ended upon the rendering of a final decision by the Administrator.

(aa) *Judicial review.* (1) The Administrator shall designate the General Counsel, Environmental Protection Agency as the officer upon whom copy of any petition for judicial review must be served. This officer shall be responsible for filing in the court the record on which the order of the Administrator is based.

(2) Before forwarding the record to the court, the Agency shall advise the petitioner of costs of preparing it and as soon as payment to cover fees is made, shall forward the record to the court.

[45 FR 63772, Sept. 25, 1980, as amended at 50 FR 35387, Aug. 30, 1985]

§ 86.1015 Treatment of confidential information.

(a) Any manufacturer may assert that some or all of the information submitted pursuant to this subpart is entitled to confidential treatment as provided by 40 CFR Part 2, Subpart B.

(b) Any claim of confidentiality must accompany the information at the time it is submitted to EPA.

(c) To assert that information submitted pursuant to this subpart is confidential, a manufacturer must indicate clearly the items of information claimed confidential by marking, circling, bracketing, stamping, or otherwise specifying the confidential information. Furthermore, EPA requests, but does not require, that the submitter also provide a second copy of its submittal from which all confidential information has been deleted. If a need arises to publicly release nonconfidential information, EPA will assume that the submitter has accurately deleted the confidential information from this second copy.

(d) If a claim is made that some or all of the information submitted pursuant to this subpart is entitled to confidential treatment, the information covered by that confidentiality claim will be disclosed by the Administrator only to the extent and by means of the procedures set forth in Part 2, Subpart B, of this chapter.

(e) Information provided without a claim of confidentiality at the time of submission may be made available to the public by EPA without further notice to the submitter, in accordance with 40 CFR 2.204(c)(2)(i)(A).

[50 FR 34798, Aug. 27, 1985]

Subpart L—Nonconformance Penalties for Gasoline-Fueled and Diesel Heavy-Duty Engines and Heavy-Duty Vehicles, Including Light-Duty Trucks

SOURCE: 50 FR 35388, Aug. 30, 1985, unless otherwise noted.

§ 86.1101-87 Applicability.

The provisions of this subpart are applicable for 1987 and later model year gasoline-fueled and diesel heavy-duty engines and heavy-duty vehicles. These vehicles include light-duty trucks rated in excess of 6,000 pounds gross vehicle weight.

§ 86.1102-87 Definitions.

(a) The definitions in this section apply to this subpart.

(b) As used in this subpart, all terms not defined herein have the meaning given then in the Act.

"Compliance level" means the deteriorated pollutant emissions level at the 60th percentile point for a population of heavy-duty engines or heavy-duty vehicles subject to Production Compliance Audit testing pursuant to the requirements of this subpart. A compliance level can only be determined for a pollutant for which an upper limit has been established in this subpart.

"Configuration" means a subdivision, if any, of a heavy-duty engine family for which a separate projected sales figure is listed in the manufacturer's Application for Certification and which can be described on the basis of emission control system, governed speed, injector size, engine calibration, or other parameters which may be designated by the Administrator, or a subclassification of light-duty truck engine family emission control system combination on the basis of engine code, inertia weight class, transmission type and gear ratios, rear axle ratio, or other parameters which may be designated by the Administrator.

"NCP" means a nonconformance penalty as described in section 206(g) of the Clean Air Act and in this subpart.

"PCA" means a Production Compliance Audit as described in § 86.1106-87 of this subpart.

"Subclass" means a classification of heavy-duty engines or heavy-duty vehicles based on such factors as gross vehicle weight rating, fuel usage, vehicle usage, engine horsepower or additional criteria that the Administrator shall apply, Subclasses include, but are not limited to:

Light-duty gasoline trucks (6,001-8,500 lb. GVW)
Light-duty diesel trucks (6,001-8,500 lb. GVW)
Light heavy-duty gasoline engines (for use in vehicles of 8,501-14,000 lb. GVW)
Heavy heavy-duty gasoline engines (for use in vehicles of 14,001 lb. and above GVW)
Light heavy-duty diesel engines (see § 86.085-2(a)(1))
Medium heavy-duty diesel engines (see § 86.085-2(a)(2))
Heavy heavy-duty diesel engines (see § 86.085-2(a)(3))

"Test Sample" means a group of heavy-duty engines or heavy-duty vehicles of the same configuration which have been selected to receive emission testing.

"Upper limit" means the emission level for a specific pollutant above which a certificate of conformity may not be issued or may be suspended or revoked.

§ 86.1103–87 Criteria for availability of nonconformance penalties.

(a) EPA shall establish for each subclass of heavy-duty engines and heavy-duty vehicles (other than motorcycles), an NCP for a motor vehicle pollutant, when any new or revised emission standard is more stringent than the previous standard for the pollutant, or when an existing standard for that pollutant becomes more difficult to achieve because of a new or revised standard, provided that EPA finds:

(1) That for such subclass of engines or vehicles, substantial work will be required to meet the standard for which the NCP is offered, and

(2) That there is likely to be a technological laggard.

(b) Substantial work, as used in paragraph (a)(1) of this section, means the application of technology not previously used in an engine or vehicle class or subclass, or the significant modification of existing technology or design parameters, needed to bring the vehicle or engine into compliance with either the more stringent new or revised standard or an existing standard which becomes more difficult to achieve because of a new or revised standard.

§ 86.1104–87 Determination of upper limits.

(a) The upper limit applicable to a pollutant emission standard for a subclass of heavy-duty engines or heavy-duty vehicles for which an NCP is established in accordance with § 86.1103-87, shall be the previous pollutant emission standard for that subclass.

(b) If no previous standard existed for the pollutant under paragraph (a), the upper limit will be developed by EPA during rulemaking.

(c) If a manufacturer participates in the emissions averaging program and carries over certification of an engine family from the prior model year, the upper limit for that engine family shall be the family emission limit of the prior model year, unless the family emission limit is less than the upper limit determined in paragraph (a) of this section.

§ 86.1105-87 Emission standards for which nonconformance penalties are available.

(a) [Reserved]

(b) Effective in the model years indicated, NCPs will be available for the following emission standards:

(1) Diesel heavy-duty engine oxides of nitrogen emission standard of 6.0 grams per brake horsepower-hour, effective in the 1990 model year.

(i) For light heavy-duty diesel engines:

(A) The following values shall be used to calculate an NCP in accordance with § 86.1113-87(a):

(*1*) COC_{50}: \$18

(*2*) COC_{90}: \$41

(*3*) MC_{50}: \$49 per gram per brake horsepower-hour.

(*4*) F: 1.2

(B) The following factor shall be used to calculate the engineering and development component of the NCP in accordance with § 86.1113-87(h): 0.36

(ii) For medium heavy-duty diesel engines:

(A) The following values shall be used to calculate an NCP in accordance with § 86.1113-87(a):

(*1*) COC_{50}: \$1125

(*2*) COC_{90}: \$1540

(*3*) MC_{50}: \$883 per gram per brake horsepower-hour.

(*4*) F: 1.2

(B) The following factor shall be used to calculate the engineering and development component of the NCP in accordance with § 86.1113-87(h): 0.02

(iii) For heavy heavy-duty diesel engines:

(A) The following value shall be used to calculate an NCP in accordance with § 86.1113-87(a):

(*1*) COC_{50}: \$1278

(*2*) COC_{90}: \$1980

(*3*) MC_{50}: \$1733

(*4*) F: 1.2

(B) The following factor shall be used to calculate the engineering and development component of the NCP in accordance with § 86.1113-87(h): 0.02

(2) Diesel heavy-duty engine particulate emission standard of 0.60 gram per brake horsepower-hour, effective in the 1988 model year.

(i) For light heavy-duty diesel engines:

(A) The following values shall be used to calculate an NCP in accordance with § 86.1113-87(a):

(*1*) COC_{50}: \$71

(*2*) COC_{90}: \$83

(*3*) MC_{50}: \$340 per gram brake horsepower-hour

(*4*) F: 1.2

(*5*) UL: 0.80 grams per brake horsepower-hour

(B) The following factor shall be used to calculate the engineering and development component of the NCP in accordance with § 86.1113-87(h): 0.64

(ii) For medium heavy-duty diesel engines:

(A) The following values shall be used to calculate an NCP in accordance with § 86.1113-87(a):

(*1*) COC_{50}: \$84

(*2*) COC_{90}: \$97

(*3*) MC_{50}: \$382 per gram per brake horsepower-hour

(*4*) F: 1.2

(*5*) UL: 0.80 grams per brake horsepower-hour

(B) The following factor shall be used to calculate the engineering and development component of the NCP in accordance with § 86.1113-87(h): 0.62

(iii) For heavy heavy-duty diesel engines:

(A) The following values shall be used to calculate an NCP in accordance with § 86.1113-87(a):

(*1*) COC_{50}: \$87

(*2*) COC_{90}: \$101

(*3*) MC_{50}: \$725 per gram per brake horsepower-hour

(*4*) F: 1.2

(*5*) UL: 0.80 grams per brake horsepower-hour.

(B) The following factor shall be used to calculate the engineering and development component of the NCP in accordance with § 86.1113-87(h): 0.60

(c) Effective in the 1991 model year, NCPs will be available for the following emission standards: (1) Diesel light-duty truck (rated in excess of 6,000 pounds GVWR) particulate emission standard of 0.13 grams per vehicle mile.

(d) The values of COC_{50}, COC_{90} and MC_{50} in paragraphs (a) and (b) of this section are expressed in December 1984 dollars. These values shall be adjusted for inflation to dollars as of January of the calendar year preceding the model year in which the NCP is first available by using the change in the overall Consumer Price Index.

[50 FR 53466, Dec. 31, 1985, as amended at 52 FR 47870, Dec. 16, 1987; 53 FR 43878, Oct. 31, 1988]

§ 86.1106–87 Production compliance auditing.

For a model year in which upper limits for heavy-duty engine or heavy-duty vehicle emission standards for one or more exhaust pollutants are specified in § 86.1105–87, a manufacturer may elect to conduct a Production Compliance Audit (PCA) for each engine or vehicle configuration satisfying the following conditions:

(a) Certification test results, pursuant to § 86.082–23, exceed the emission standard for a particular pollutant but do not exceed the upper limit established for that pollutant. In that event, the manufacturer will be offered a qualified certificate of conformity allowing for the introduction into commerce of the specified engine family, *Provided,* That:

(1) The manufacturer must agree to conduct a PCA of those engines or vehicles;

(2) PCA testing must be conducted on the same configuration tested in certification;

(3) The selection of engines or vehicles for PCA testing must be initiated no later than five (5) days after the start of assembly-line production of the specified engine or vehicle configuration, unless that period is extended by the Administrator;

(4) The manufacturer must agree:

(i) To pay the NCP amount calculated as a result of PCA testing on each engine or vehicle, unless the manufacturer successfully challenges the Administrator's determination of the compliance level or penalty calculation or both under § 86.1115–87(c);

(ii) To recall any engines or vehicles introduced into commerce, without invoking the procedural requirements of section 207(c) of the Clean Air Act, if the compliance level for the engine or vehicle configuration of (a)(2) exceeds the upper limit as determined by the PCA;

(5) If the compliance level determined in the PCA is below the emission standard, no NCP will be offered, and all appropriate qualifications will be removed from the qualified certificate of conformity.

(b) An engine or vehicle configuration fails a Selective Enforcement Audit (SEA) under Subpart K of 40 CFR Part 86 with respect to the standard for a particular pollutant but does not fail with respect to the upper limit established for that pollutant, and no NCP has been previously assessed for that configuration, *Provided,* That:

(1) The manufacturer must submit a written report to the Administrator within five (5) days after failure to pass the audit containing the following:

(i) A statement that the manufacturer does not intend, at that time, to make any engine and/or emission control system design changes that may remedy the nonconformity; and

(ii) A request from the manufacturer to conduct the PCA, including the date the testing will begin;

(2) Failure to submit the report within five (5) days after the SEA failure will result in the forfeiture of the NCP option, unless a satisfactory justification for the delay is provided to the Administrator;

(3) The selection of any required engines or vehicles for PCA testing must be initiated no later than ten (10) days after the SEA failure unless extended by the Administrator; otherwise, the manufacturer may forfeit the option to elect an NCP;

(4) PCA testing must be conducted on the same configuration that failed the SEA;

(5) Test results from the SEA, together with any additional test results required during the PCA, will be used in establishing a compliance level for the configuration pursuant to § 86.1112–87(a); and

(6) The manufacturer, upon approval by the Administrator to conduct a PCA on a failed SEA engine or vehicle configuration, must agree:

(i) To pay the NCP amount calculated as a result of PCA testing on each engine or vehicle introduced into commerce after the tenth day of the SEA failure, unless the manufacturer successfully challenges the Administrator's determination of the compliance level or penalty calculation or both under § 86.1115-87(c);

(ii) To recall any engines or vehicles introduced into commerce after the tenth day of the SEA failure, without invoking the procedural requirements of section 207(c) of the Clean Air Act, if the compliance level of the engine or vehicle configuration exceeds the upper limit as determined by the PCA.

(c) An engine or vehicle configuration, for which an NCP has been previously assessed for a particular pollutant, either passes an SEA with respect to the particular pollutant standard, fails an SEA with respect to the particular pollutant standard but not the previous compliance level, or fails an SEA with respect to the previous compliance level but not the associated upper limit, *Provided*, That:

(1) The manufacturer must submit a written statement to the Administrator within five (5) days of the conclusion of the SEA requesting a PCA, including the date the PCA testing will begin; otherwise, the manufacturer forfeits the option to establish a new compliance level;

(2) The selection of any required engines or vehicles for PCA testing must be initiated no later than ten (10) days after the conclusion of the SEA unless the period is extended by the Administrator; otherwise, the manufacturer forfeits the option to establish a new compliance level;

(3) PCA testing must be conducted on the same configuration tested during the SEA, and all conditions in the SEA test order must apply to the PCA;

(4) Test results for the SEA, together with any additional test results required during the PCA, will be used in establishing a new compliance level for the configuration pursuant to § 86.1112-87(a);

(5) The manufacturer must agree:

(i) To pay the NCP amount calculated as a result of PCA testing on each engine or vehicle introduced into commerce after the tenth day of the conclusion of the SEA, unless the manufacturer successfully challenges the Administrator's determination of the compliance level or penalty calculation or both under § 86.1115-87(c);

(ii) To recall any engines or vehicles introduced into commerce after the tenth day after the conclusion of the SEA, without invoking the procedural requirements of section 207(c) of the Clean Air Act, if the engine or vehicle configuration exceeds the upper limit as determined by the PCA;

(6) A previously assessed NCP will be terminated and no NCP will be established as a result of the new PCA if the compliance level is determined to be below the applicable emission standards.

(d) The implementation of a production running change that causes the emission level for a particular pollutant to be either above the emission standard but below the associated upper limit for a vehicle or engine configuration for which an NCP has not been previously assessed, or below the associated upper limit for a vehicle or engine configuration for which an NCP has been previously assessed, regardless of the previous compliance level. In that event, the manufacturer will be offered a qualified certificate of conformity allowing for the introduction into commerce of the engine or vehicle configuration resulting from the running change, *Provided*, That:

(1) The manufacturer must submit a written report to the Administrator outlining the reason for the running change and the date the manufacturer will begin PCA testing;

(2) The manufacturer must agree:

(i) To pay the NCP amount calculated as a result of PCA testing on each engine or vehicle, unless the manufacturer successfully challenges the Administrator's determination of compliance level or penalty calculation or both under § 86.1115-87(c);

(ii) To recall any engines or vehicles introduced into commerce, without invoking the procedural requirements of section 207(c) of the Clean Air Act, if the engine or vehicle configuration exceeds the upper limit as determined by the PCA;

(3) The selection of engines or vehicles for PCA testing must be initiated no later than five (5) days after the start of assembly line production of the engine or vehicle configuration resulting from the running change unless that period is extended by the Administrator; and

(4) If the compliance level is determined to be below the applicable emission standard, a previously assessed NCP will be terminated, an NCP will not be established as a result of the PCA testing, and all qualifications will be removed from the qualified certificate of conformity.

(e) The following requirements are applicable to each PCA under this subpart.

(1) The manufacturer shall make the following documents available to EPA Enforcement Officers upon request;

(i) A properly filed and current application for certification, following the format prescribed by the EPA for the appropriate model year; and

(ii) A copy of the shop manual and dealer service bulletins for the configurations being tested.

(2) Only one mechanic at a time per engine or vehicle shall make authorized checks, adjustments, or repairs, unless a particular check, adjustment, or repair requires a second mechanic as indicated in the shop manual or dealer service bulletins.

(3) A mechanic shall not perform any check, adjustment, or repair without an Enforcement Officer present unless otherwise authorized.

(4) The manufacturer shall utilize only those tools and test equipment utilized by its dealers or those dealers using its engines when performing authorized checks, adjustments, or repairs.

§ 86.1107-87 Testing by the Administrator.

(a) The Administrator may require that engines or vehicles of a specified configuration be selected in a manner consistent with the requirements of § 86.1110-87 and submitted to him at such place as he may designate for the purpose of conducting emission tests in accordance with § 86.1111-87 to determine whether engines or vehicles manufactured by the manufacturer conform with the regulations of this subpart.

(b)(1) Whenever the Administrator conducts a test on a test engine or vehicle or the Administrator and manufacturer each conduct a test on the same test engine or vehicle, the results of the Administrator's test will comprise the official data for that engine or vehicle.

(2) Whenever the manufacturer conducts all tests on a test engine or vehicle, the manufacturer's test data will be accepted as the official data, provided that if the Administrator makes a determination based on testing under paragraph (a) of this section that there is a substantial lack of agreement between the manufacturer's test results and the Administrator's test results, no manufacturer's test data from the manufacturer's test facility will be accepted for purposes of this subpart.

(c) If the Administrator determines that testing conducted under paragraph (a) of this section demonstrates a lack of agreement under paragraph (b)(2) of this section, the Administrator shall:

(1) Notify the manufacturer in writing of his determination that the manufacturer's test facility is inappropriate for conducting the tests required by this subpart and the reasons therefore; and

(2) Reinstate any manufacturer's data only upon a showing by the manufacturer that the data acquired under paragraph (a) of this section was erroneous and the manufacturer's data was correct.

(d) The manufacturer may request in writing that the Administrator reconsider his determination in paragraph (b)(2) of this section based on data or information which indicates that changes have been made to the test facility and that these changes have resolved the reasons for disqualification.

§ 86.1108-87 Maintenance of records.

(a) The manufacturer of any new gasoline-fueled or diesel heavy-duty engine or heavy-duty vehicle subject to any of the provisions of this subpart shall establish, maintain, and retain the following adequately organized and indexed records:

(1) *General records.* A description of all equipment used to test engines or vehicles in accordance with § 86.1111-87, pursuant to PCA testing under this subpart, specifically;

(i) If testing heavy-duty gasoline engines, the equipment requirements specified in §§ 86.1306-84 and 86.1506-84 of this part.

(ii) If testing heavy-duty diesel engines, the equipment requirements specified in §§ 86.1306-84, 86.1506-84 86.879-6, 86.879-8 and 86.879-9 of this part;

(iii) If testing light-duty gasoline-fueled trucks, the equipment requirements specified in §§ 86.106 (excluding all references to particulate emission testing) and 86.1506-84 of this part; and

(iv) If testing light-duty diesel trucks, the equipment requirements specified in § 86.106 (excluding all references to evaporative emission testing) of this part.

(2) *Individual records.* These records pertain to each Production Compliance Audit conducted pursuant to this subpart.

(i) The date, time, and location of each test;

(ii) The number of hours of service accumulated on the engine or the number of miles on the vehicle when the test began and ended;

(iii) The names of all supervisory personnel involved in the conduct of the Production Compliance Audit;

(iv) A record and description of any repair performed, giving the date and time of the repair, the reason for it, the person authorizing it, and the names of all personnel involved in the supervision and performance of the repair;

(v) The date when the engine or vehicle was shipped from the assembly plant or associated storage facility and when it was received at the testing facility;

(vi) A complete record of all emission tests performed pursuant to this subpart (except tests performed by EPA directly), including all individual worksheets and/or other documentation relating to each test, or exact copies thereof, specifically—

(A) If testing heavy-duty gasoline engines, the record requirements specified in §§ 86.1342-84 and 86.1542-84 of this part;

(B) If testing heavy-duty diesel engines, the record requirements specified in §§ 86.1342-84, 86.1542-84, and § 86.879-10; (§ 86.337-79 for Subpart D testing only).

(C) If testing light-duty gasoline fueled trucks, the record requirements specified in §§ 86.142 (excluding all references to diesel vehicles) and 86.1542-84; and

(D) If the testing light-duty diesel trucks, the record requirements specified in § 86.142; and

(vii) A brief description of any significant Production Compliance Audit events commencing with the test engine or vehicle selection process, but not described by any subparagraph under paragraph (a)(2) of this section, including such extraordinary events as engine damage during shipment or vehicle accident.

(3) The manufacturer shall record the test equipment description, pursuant to paragraph (a)(1) of this section, for each test cell that was used to perform emission testing under this subpart.

(b) The manufacturer shall retain all records required to be maintained under this subpart for a period of six (6) years after completion of all testing. Records may be retained as hard copy or reduced to microfilm, punch cards, etc., depending upon the manufacturer's record retention procedure, provided that in every case all the information contained in the hard copy is retained.

§ 86.1109-87 Entry and access.

(a) To allow the Administrator to determine whether a manufacturer is complying with the provisions of this subpart, EPA Enforcement Officers are authorized to enter any of the following (during operating hours and upon presentation of credentials):

(1) Any facility where any engine or vehicle to be introduced into commerce or any emission related component is manufactured, assembled, or stored;

(2) Any facility where any tests conducted pursuant to a PCA request or any procedures or activities connected with these tests are or were performed;

(3) Any facility where any engine or vehicle which is being tested, was tested, or will be tested is present; and

(4) Any facility where any record or other document relating to any of the above is located.

(b) Upon admission to any facility referred to in paragraph (a) of this section, EPA Enforcement Officers are authorized to perform the following inspection-related activities:

(1) To inspect and monitor any aspects of engine or vehicle manufacture, assembly, storage, testing and other procedures, and the facilities in which these procedures are conducted.

(2) To inspect and monitor any aspect of engine or vehicle test procedures or activities, including, but not limited to, monitoring engine or vehicle selection, preparation, service or mileage accumulation, preconditioning, repairs, emission test cycles, and maintenance; and to verify calibration of test equipment;

(3) To inspect and make copies of any records or documents related to the assembly, storage, selection and testing of an engine or vehicle; and

(4) To inspect and photograph any part or aspect of any engine or vehicle and any component used in the assembly thereof that is reasonably related to the purpose of the entry.

(c) EPA Enforcement Officers are authorized to obtain reasonable assistance without cost from those in charge of a facility to help them perform any function listed in this subpart and are authorized to request the manufacturer conducting the PCA to make arrangement with those in charge of a facility operated for its benefit to furnish reasonable assistance without cost to EPA, whether or not the manufacturer controls the facility.

(d) EPA Enforcement Officers are authorized to seek a warrant or court order authorizing the EPA Enforcement Officers to conduct activities related to entry and access as authorized in this section, as appropriate, to execute the functions specified in this section. EPA Enforcement Officers may proceed ex parte to obtain a warrant whether or not the Enforcement Officers first attempted to seek permission of the manufacturer conducting the PCA or the party in charge of the facilities in question to conduct activities related to entry and access as authorized in this section.

(e) A manufacturer that conducts a PCA shall permit EPA Enforcement Officers who present a warrant or court order as described in paragraph (d) of this section to conduct activities related to entry and access as authorized in this section and as described in the warrant or court order. The manufacturer shall cause those in charge of its facility or a facility operated for its benefit to permit EPA Enforcement Officers to conduct activities related to entry and access as authorized in this section pursuant to a warrant or court order whether or not the manufacturer controls the facility. In the absence of such a warrant or court order, EPA Enforcement Officers may conduct activities related to entry and access as authorized in this section only upon the consent of the manufacturer or the party in charge of the facilities in question.

(f) It is not a violation of this part or the Clean Air Act for any person to refuse to permit EPA Enforcement Officers to conduct activities related to entry and access as authorized in this section without a warrant or court order.

(g) A manufacturer is responsible for locating its foreign testing and manufacturing facilities in jurisdictions in which local foreign law does not prohibit EPA Enforcement Officers from conducting the entry and access activities specified in this section. EPA will not attempt to make any inspections which it has been informed that local foreign law prohibits.

(h) For purposes of this section, the following definitions are applicable:

(1) "Presentation of Credentials" means display of the document designating a person as an EPA Enforcement Officer.

(2) Where engine or vehicle storage areas or facilities are concerned, "operating hours" means all times during which personnel other than custodial

personnel are at work in the vicinity of the area or facility and have access to it.

(3) Where facilities or areas other than those covered by paragraph (h)(2) of this section are concerned, "operating hours" means all times during which an assembly line is in operation, engine or vehicle assembly is taking place, testing repair, service accumulation, preparation or compilation of records is taking place, or any other procedure or activity related to engine or vehicle manufacture, assembly or testing is being carried out in a facility.

(4) "Reasonable assistance" includes, but is not limited to, clerical, copying, interpreting and translating services, and making personnel of the facility being inspected available during their working hours on an EPA Enforcement Officer's request to inform the EPA Enforcement Officer of how the facility operates and to answer his or her questions. Any employee whom an EPA Enforcement Officer requests the manufacturer to cause to appear for questioning will be entitled to be accompanied, represented and advised by counsel.

§ 86.1110-87 Sample selection.

(a) Engines or vehicles comprising a test sample which are required to be tested pursuant to a PCA in accordance with this subpart will be selected at the location and in the manner specified by EPA. If a manufacturer determines that the test engines or vehicles cannot be selected in the manner specified by EPA, an alternative selection procedure may be employed, provided that the manufacturer requests approval of the alternative procedure in advance of the start of test sample selection and that the Administrator approves the procedure.

(b) The manufacturer shall have assembled the test engines or vehicles of the configuration selected for testing using its normal mass production processes for engines or vehicles to be distributed into commerce. In the case of heavy-duty engines, if the test engines are selected at a location where they do not have their operational and emission control systems installed, EPA will specify the manner and location for selection of components to complete assembly of the engines. The manufacturer shall assemble these components onto the test engines using normal assembly and quality control procedures as documented by the manufacturer.

(c) No quality control, testing, or assembly procedures will be used on the completed test engine or vehicle or any portion thereof, including parts and subassemblies, that will not be used during the production and assembly of all other engines or vehicles of that configuration.

(d) The EPA Enforcement Officers may specify that they, rather than the manufacturer, will select the test engines or vehicles.

(e) The order in which test engines or vehicles are selected determines the order in which test results are to be used in applying the PCA testing plan in accordance with § 86.1112-87.

(f) The manufacturer shall keep on hand all engines or vehicles comprising the test sample until such time as a compliance level is determined in accordance with § 86.1112-87(a) except that the manufacturer may ship any tested engine or vehicle which has not failed in accordance with § 86.1112-87(f)(1). However, once the manufacturer ships any test engine or vehicle, it relinquishes the prerogative to conduct retests as provided in § 86.1111-87(i).

§ 86.1111-87 Test procedures for PCA testing.

(a)(1) For heavy-duty engines, the prescribed test procedure for PCA testing is the Federal Test Procedure as described in Subparts N, I, and P of this part.

(2) For heavy-duty vehicles, the prescribed test procedure for PCA testing is described in Subpart M of this part.

(3) For light-duty trucks, the prescribed test procedure for PCA testing is the Federal Test Procedure as described in Subparts B and P of this part.

(4) When testing light-duty trucks, the following exceptions to the test procedures in Subpart B are applicable:

(i) The manufacturer may use gasoline test fuel meeting the specifications of paragraph (a) of § 86.113 for mileage accumulation. Otherwise, the manufacturer may use fuels other than those specified in this section only with advance approval of the Administrator.

(ii) The manufacturer may measure the temperature of the test fuel at other than the approximate midvolume of the fuel tank, as specified in paragraph (a) of § 86.131, and may drain the test fuel from other than the lowest point of the fuel tank, as specified in paragraph (b) of § 86.131, with the advance approval of the Administrator.

(iii) The manufacturer may perform additional preconditioning on PCA test vehicles other than the preconditioning specified in § 86.132 only if the additional preconditioning has been performed on certification test vehicles of the same configuration.

(iv) The manufacturer shall perform the heat build procedure 11 to 34 hours following vehicle preconditioning rather than according to the time period specified in paragraph (a) of § 86.133.

(v) The manufacturer may substitute slave tires for the drive wheel tires on the vehicle as specified in paragraph (e) of § 86.135, provided that the slave tires are the same size as the drive wheel tires.

(vi) The cold start exhaust emission test described in § 86.137 shall follow the heat build procedure described in § 86.133 by not more than one hour.

(vii) In performing exhaust sample analysis under § 86.140:

(A) When testing diesel vehicles, the manufacturer shall allow a minimum of 20 minutes warm-up for the HC analyzer, and a minimum of 2 hours warm-up for the CO, CO_2 and NO_x analyzers. [Power is normally left on for infrared and chemiluminescent analyzers. When not in use, the chopper motors of the infrared analyzers are turned off and the phototube high voltage supply to the chemiluminescent analyzers is placed in the standby position.]

(B) The manufacturer shall exercise care to prevent moisture from condensing in the sample collection bags.

(viii) The manufacturer need not comply with § 86.142, since the records required therein are provided under other provisions of this subpart.

(ix) In addition to the requirements of Subpart B of this part, the manufacturer shall prepare gasoline-fueled vehicles as follows prior to exhaust emission testing:

(A) The manufacturer shall inspect the fuel system to insure the absence of any leaks of liquid or vapor to the atmosphere by applying a pressure of 14.5 ± 0.5 inches of water to the fuel system, allowing the pressure to stabilize, and isolating the fuel system from the pressure source. Following isolation of the fuel system, pressure must not drop more than 2.0 inches of water in 5 minutes. If required, the manufacturer shall perform corrective action in accordance with paragraph (d) of this section.

(B) When performing this pressure check, the manufacturer shall exercise care to neither purge nor load the evaporative emission control system.

(C) The manufacturer shall not modify the test vehicle's evaporative emission control system by component addition, deletion, or substitution, except to comply with paragraph (a)(4)(ii) of this section if approved in advance by the Administrator.

(b)(1) The manufacturer shall not adjust, repair, prepare, or modify the engines or vehicles selected for testing and shall not perform any emission tests on engines or vehicles selected for testing pursuant to a PCA request unless the adjustment, repair, preparation, modification, or tests are documented in the manufacturer's engine or vehicle assembly and inspection procedures and are actually performed on all engines or vehicles produced or unless these adjustments or tests are required or permitted under this subpart or are approved in advance by the Administrator.

(2) For 1984 and later model years the Administrator may adjust or cause to be adjusted any engine parameter which the Administrator has determined to be subject to adjustment for certification, Selective Enforcement Audit and Production. Compliance Audit testing in accordance with § 86.084-22(e)(1), to any setting within

the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.084-2(e)(3)(ii), prior to the performance of any tests. However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to any setting which causes a lower engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter if the manufacturer had accumulated 125 hours of service on the engine or 4,000 miles on the vehicle under paragraph (c) of this section, all other parameters being identically adjusted for the purpose of the comparison. The manufacturer may be requested to supply information to establish such an alternative minimum idle speed. The Administrator, in making or specifying these adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use heavy-duty engines or light-duty trucks. In determining likelihood, the Administrator may consider factors such as, but not limited to, the effect of the adjustment on engine or vehicle performance characteristics and surveillance information from similar in-use engines or vehicles.

(c) Prior to performing emission testing on a PCA test engine, the manufacturer may accumulate on each engine a number of hours of service equal to the greater of 125 hours or the number of hours the manufacturer accumulated during certification on the emission-data engine corresponding to the configuration tested during PCA. Prior to performing emission testing on a PCA test vehicle, the manufacturer may accumulate a number of miles equal to the greater of 4,000 miles or the number of miles the manufacturer accumulated during certification on the emission-data vehicle corresponding to the configuration tested during PCA. Service or mileage accumulation may be performed in any manner the manufacturer desires.

(d) No maintenance shall be performed on test engines or vehicles after selection for testing nor will any test engine or vehicle substitution or replacement be allowed, unless requested of and approved by the Administrator in advance of the performance of any maintenance or engine or vehicle substitution.

(e) The manufacturer shall expeditiously ship test engines or vehicles from the point of selection to the test facility or other location to meet any other requirements of this subpart. If the test facility is not located at or in close proximity to the point of selection, the manufacturer shall assure that test engines or vehicles arrive at the test facility within 24 hours of selection, except that the Administrator may approve more time based upon a request by the manufacturer accompanied by a satisfactory justification.

(f) If an engine or vehicle cannot complete the service or mileage accumulation or emission tests because of engine or vehicle malfunction, the manufacturer may request that the Administrator authorize the repair of the engine or vehicle. If the engine or vehicle cannot be repaired expeditiously, EPA may delete it from the test sequence.

(g)(1) Heavy-duty engine manufacturers with projected sales bound for the United States market for that year of 30,000 or greater, as made in their respective Applications for Certification, shall complete emission testing at their testing facility on a minimum of two engines per 24 hour period, including voided tests.

(2) Heavy-duty engine manufacturers with projected sales bound for the United States market for that year of less than 30,000, as made in their respective Applications for Certification, Shall complete emission testing at one engine per 24 hour period, including voided tests.

(3) Light-duty truck manufacturers shall complete emission testing on a minimum of four vehicles per 24 hour period, including voided tests.

(4) The Administrator may approve a longer period of time for conducting emission tests based upon a request by a manufacturer accompanied by a satisfactory justification.

(h) The manufacturer shall perform test engine or vehicle selection, shipping, preparation, service or mileage accumulation, and testing in such a manner as to insure that the audit is performed in an expeditious manner.

(i) The manufacturer may retest any engines or vehicles tested during a Production Compliance Audit once a compliance level has been established in accordance with § 86.1112-87 based on the first test on each engine or vehicle. The Administrator may approve retesting at other times based upon a request by the manufacturer accompanied by a satisfactory justification. The manufacturer may test each engine or vehicle a total of three times. The manufacturer shall test each engine or vehicle the same number of times. The manufacturer may accumulate additional service or mileage before conducting a retest, subject to the provisions of paragraph (c) of this section.

§ 86.1112-87 Determining the compliance level and reporting of test results.

(a) A manufacturer that has elected to conduct a PCA in accordance with § 86.1106-87 may establish the compliance level for a pollutant for any engine or vehicle configuration by using the primary PCA sampling plan or either of two optional reduced PCA sampling plans (the fixed reduced sampling plan or the sequential reduced sampling plan) described below. A manufacturer that uses either of the two optional reduced PCA sampling plans may elect to continue testing and establish a compliance level under the primary PCA sampling plan.

(1) A manufacturer that elects to conduct a PCA for a pollutant using the primary PCA sampling plan shall:

(i) Conduct emission tests on 24 engines or vehicles in accordance with § 86.1111-87 for the pollutants for which the PCA was initiated. If the PCA follows an SEA failure, the number of additional tests conducted shall be the difference between 24 and the number of engines or vehicles tested in the SEA. If 24 or more engines or vehicles were tested in the SEA, no additional tests shall be conducted; and

(ii) Rank the final deteriorated test results, as defined by paragraph (e) of this section, obtained for that pollutant in order from the lowest to the highest value. If the PCA follows an SEA failure, all SEA test results for that pollutant shall be included in this ranking.

(iii) The compliance level for that pollutant is the final deteriorated test result in the sequence determined from Table 1 of Appendix XII of these regulations.

(2) A manufacturer that elects to conduct a PCA for a pollutant using the fixed reduced PCA sampling plan shall:

(i) Select a sample size between 3 and 23 engines or vehicles. If the PCA follows an SEA failure, the sample size selected cannot be less than the number of engines or vehicles tested during the SEA; and

(ii) Conduct emission tests on the selected sample in accordance with § 86.1111-87 for the pollutants for which the PCA was initiated.

(iii) The compliance level for the pollutant is the result of the following equation, using the test results obtained in paragraph (a)(2)(ii) of this section and all SEA test results for that pollutant if the PCA follows an SEA failure:

$$CL=\bar{X}+Ks$$

where:

CL=The compliance level.

$\bar{X}$=The mean of the final deteriorated test results, as defined by paragraph (e) of this section.

K=A value that depends on the size of the test sample. See Table 2 of Appendix XII of this part for the value of K that corresponds to the size of the test sample.

s=The sample standard deviation.

The compliance level is rounded to the same number of significant figures contained in the applicable standard in accordance with ASTM E29-67.

(3) A manufacturer that elects to conduct a PCA for a pollutant using the sequential reduced PCA sampling plan shall perform the following:

(i) Select a sample size of 4, 8, 12, 16 or 20 engines or vehicles. If the PCA follows an SEA failure, the sample size selected cannot be less than the number of engines or vehicles tested during the SEA.

(ii) Conduct emission tests on the selected sample in accordance with § 86.1111-87 for the pollutants for which the PCA was initiated.

(iii) The compliance level for the pollutant is the result of the following equation, using the test results obtained in (a)(3)(ii) and all SEA test results for that pollutant if the PCA follows an SEA failure:

$CL=\bar{X}+Ks$

where:

CL=The compliance level.

$\bar{X}$=The mean of the final deteriorated test results, as defined by paragraph (e) of this section.

K=A value that depends on the size of the test sample. See Table 3 of Appendix XII of this part for the value of K that corresponds to the size of the test sample.

s=The sample standard deviation.

The compliance level is rounded to the same number of significant figures contained in the applicable standard in accordance with ASTM E29-67.

(iv) After calculating a compliance level in accordance with paragraph (a)(3)(iii) of this section, a manufacturer may elect to increase the sample size by 4 engines or vehicles, or a multiple thereof, up to the maximum, including SEA engines or vehicles if any, of 20. Upon that election, the manufacturer shall add the additional engines or vehicles to the sample and perform paragraphs (a)(3)(ii) and (a)(3)(iii) of this section. This election may be repeated if appropriate. A compliance level determined under this election shall replace a previously determined compliance level.

(b) A fail decision is reached with respect to the upper limit when the compliance level determined in paragraph (a) of this section exceeds the applicable upper limit.

(c) Initial test results are calculated following the Federal Test Procedure specified in § 86.1111-87(a).

(d) Final test results are calculated by summing the initial test results derived in paragraph (c) of this section for each test engine or vehicle, dividing by the number of tests conducted on the engine or vehicle, and rounding in accordance with ASTM E29-67 to the same number of decimal places contained in the applicable standard expressed to one additional significant figure.

(e) Final deteriorated test results. (1) The final deteriorated test results for each heavy-duty engine or light-duty truck tested according to Subpart B, I, N, or P of this part are calculated by applying the final test results by the appropriate deterioration factor, derived from the certification process for the engine family control system combination and model year for the selected configuration to which the test engine or vehicle belongs. If the deterioration factor computed during the certification process is multiplicative and it is less than one, that deterioration factor will be one. If the deterioration factor computed during the certification process is additive and it is less than zero, that deterioration factor will be zero.

(2) The final deteriorated test results are rounded to the same number of significant figures contained in the applicable standard in accordance with ASTM E29-67.

(f) A failed engine or vehicle is one whose final deteriorated test results, for one or more of the applicable exhaust pollutants, exceed:

(1) The applicable emission standard, or

(2) The compliance level established in paragraph (b) of this section.

(g) Within five working days after completion of PCA testing of all engines or vehicles, the manufacturer shall submit to the Administrator a report which includes the following information:

(1) The location and description of the manufacturer's emission test facilities which were utilized to conduct testing reported pursuant to this section;

(2) The applicable standards against which the engines or vehicles were tested;

(3) Deterioration factors for the engine family to which the selected configuration belongs;

(4) A description of the engine or vehicle and any emission-related component selection method used;

(5) For each test conducted:

(i) Test engine or vehicle description, including;

(A) Configuration and engine family identification,

(B) Year, make and build date,

(C) Engine or vehicle identification number, and

(D) Number of hours of service accumulated on engine or number of miles on vehicle prior to testing;

(ii) Location where service or mileage accumulation was conducted and description of accumulation procedure and schedule;

(iii) Test number, date, initial test results before and after rounding, final test results and final deteriorated test results for all emission tests, whether valid or invalid, and the reason for invalidation, if applicable;

(iv) A complete description of any modification, repair, preparation, maintenance, and/or testing which was performed on the test engine or vehicle and has not been reported pursuant to any other paragraph of this subpart and will not be performed on all other production engines or vehicles; and

(v) Any other information the Administrator may request relevant to the determination as to whether the new heavy-duty engines or heavy-duty vehicles being manufactured by the manufacturer do in fact conform with the regulations of this subpart; and

(6) The following statement and endorsement:

This report is submitted pursuant to section 206 of the Clean Air Act. This Production Compliance Audit was conducted in complete conformance with all applicable regulations under 40 CFR Part 86 et seq. All data and information reported herein is, to the best of

——————————— —'s

(Company Name)———

knowledge, true and accurate. I am aware of the penalties associated with violations of the Clean Air Act and the regulations thereunder.

———————————————

(Authorized Company Representative)

§ 86.1113-87 Calculation and payment of penalty.

(a) The NCP for each engine or vehicle for which a compliance level has been determined under § 86.1112-87 is calculated according to the formula in paragraph (a)(1) or (a)(2) of this section depending on the value of the compliance level. Each formula contains an annual adjustment factor (AAF_i) which is defined in paragraph (a)(3) of this section. Other terms in the formulas are defined in paragraph (a)(4) of this section.

(1) If the compliance level (CL) is greater than the standard and less than or equal to X (e.g., point CL_1 in figure 1), then:

$$NCP_n = (PR_1)(CL-S)\left(\prod_{i=1}^{n} AAF_i\right)$$

where:

$PR_1 = (F)(MC_{50})$

(2) If the compliance level is greater than X and less than or equal to the upper limit as determined by § 86.1104-87 (e.g., point CL_2 in figure 1), then:

$$NCP_n = (COC_{50} + (PR_2)(CL-X))\left(\prod_{i=1}^{n} AAF_i\right)$$

where:

$$PR_2 = \frac{COC_{90}-COC_{50}}{UL-X}$$

(3) AAF_i has the following values:

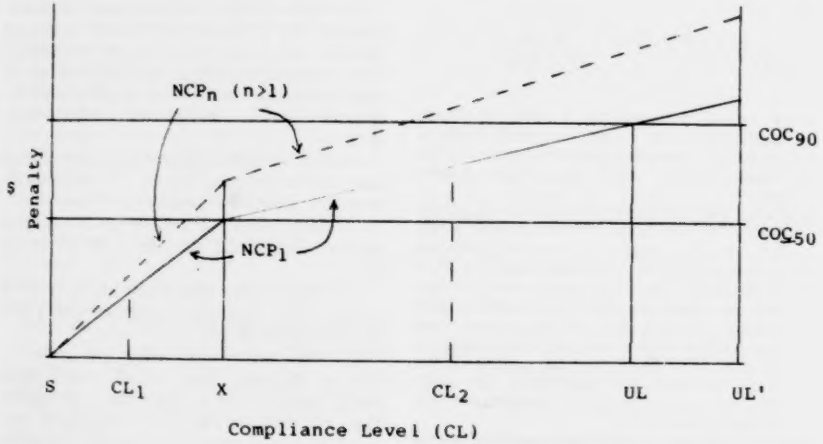
(i) If $frac_{i-1}=0$, then $AAF_i=1+I_{i-1}$

(ii) If $frac_{i-1}>0$, then:

$$AAF_i=1+I_{i-1}+A_i\left[\frac{1}{1\text{-}frac_{i-1}}\right]^{i}$$

Figure 1

Penalty vs. Compliance Level



If $frac_{i-1}>0.50$, then $frac_{i-1}$ will be set equal to 0.50.

(iii) $AAF_i=1$

(iv) In calculating the NCP for year n, the value of $frac_{i-1}$ for i=n will include actual NCP usage through March 31 of model year n-1 and EPA's estimate of additional usage for the remainder of model year n-1. The value of $frac_{i-1}$ will be corrected to reflect actual year end usage of NCPs and a corrected AAF_i will be used to establish NCPs in future years. The correction of the previous year's AAF will not affect the previous year's penalty.

(4) The terms in the above formulas have the following meanings and values, which may be determined separately for each subclass and pollutant for which an NCP is offered. The production of Federal and California designated engines or vehicles shall be combined for the purpose of this section in calculating the NCP for each engine or vehicle.

NCP_n=NCP for year n for each applicable engine or vehicle

CL=Compliance level for year n for applicable engines or vehicles

S=Emission standard

UL=Upper limit as determined by section 86.1104-87, except that, if the upper limit is determined by section 86.1104-87(c), the value of UL in paragraph (a)(2) of this section shall be the prior emission standard for that pollutant.

UL′=Upper limit as determined by section 86.1104-87(c). This value is not used in the above formulas.

X=Compliance level above the standard at which NCP_1 equals COC_{50}

$$X = \frac{COC_{50}}{(F)(MC_{50})} + S$$

PR_1=Penalty rate when $CL<X$

PR_2=Penalty rate when $X<CL<$applicable upper limit

$$\prod_{i=1}^{n} AAF_i$$ =Running product, i.e., $(AAF_1)X(AAF_2)X \ldots X(AAF_n)$

i=An index representing a year. It represents the same year for both Federal and California designated engines or vehicles of the same production model year.

n=Index representing the number of model years for which the NCP has been available for an engine or vehicle subclass (i.e., n=1 for the first year that the NCP is available, and so on until n=n for the nth year that the NCP is available). The factor "n" is based on the model year the NCP is first available, as specified in section 86.1105-87 for the engine or vehicle subclass and pollutant for both Federal and California designated engines and vehicles.

COC_{50}=Estimate of the average total incremental cost to comply with the standard relative to complying with the upper limit.

COC_{90}=Estimate of the 90th percentile total incremental cost to comply with the standard relative to complying with the upper limit.

MC_{50}=Estimate of the average marginal cost of compliance (dollars per emission unit) with the standard.

F=Factor used to estimate the 90th percentile marginal cost based on the average marginal cost (the minimum value of F is 1.1, the maximum value of F is 1.3).

AAF_i=Annual adjustment factor for year i, $frac_{i-1}$=Fraction of engines or vehicles of a subclass using NCPs in previous year (year i-1).

A_i=Usage adjustment factor in year i: A_i=0.10 for i=2; A_i=0.08 for i<2.

I_i=Percentage increase in overall consumer price index in year i.

(5) The values of COC_{50}, COC_{90}, MC_{50} and F will be determined for each applicable subclass by EPA based on the cost data used by EPA in setting the applicable emission standard. However, where the rulemaking to establish a specific NCP occurs after the rulemaking to establish the standard, EPA may augment the data base used to establish the standard by including the best cost and emission performance data available to EPA during the specific NCP rulemaking.

(6) Any NCP calculated under paragraph (a) of this section will be rounded to the nearest dollar in accordance with ASTM E29-67.

(b) The NCP determined in paragraph (a) of this section is assessed against all those engines or vehicles of the nonconforming configuration or engine family produced at all assembly plants and distributed into commerce—

(1) Since the beginning of the model year in the case of a certification failure described by § 86.1106-87(a).

(2) Beginning ten days after an SEA failure described by § 86.1106-87 (b) or (c).

(3) Following implementation of a production running change described by § 86.1106-87(d).

(c) The NCP will continue to be assessed during the model year, until such time, if any, that the configuration or engine family is brought into conformance with applicable emission standards.

(d) A manufacturer may carry over an NCP from a model year to the next model year. There is no limit to the number of years that carryover can continue. The amount of the penalty will increase each year according to paragraph (a) of this section.

(e) The Administrator shall notify the manufacturer in writing of the nonconformance penalty established under paragraph (a) of this section after the completion of the PCA under § 86.1112-87.

(f) A manufacturer may request a hearing under § 86.1115-87 as to whether the compliance level (including a compliance level in excess of the upper limit) was determined in accordance with the procedures in § 86.1112-87(a) or whether the nonconformance penalty was calculated in accordance with the procedures in § 86.1113-87(a). If a nonconformance penalty has been established, such hearing must be requested within fifteen (15) days or such other period as may be allowed by the Administrator after the notification of the nonconformance penalty. If a manufacturer wishes to challenge a compliance level in excess of the upper limit, he must request a hearing within fifteen (15) days or such other period as may be allowed by the Administrator after the completion of the Production Compliance Audit.

(g)(1) Except as provided in paragraph (g)(2) of this section, the nonconformance penalty or penalties assessed under this subpart must be paid as follows:

(i) By the quarterly due dates, i.e., within 30 days of the end of each calendar quarter (March 31, June 30, September 30 and December 31), or according to such other payment schedule as the Administrator may approve pursuant to a manufacturer's request, for all nonconforming engines or vehicles produced by a manufacturer in accordance with paragraph (b) of this section and distributed into commerce for that quarter.

(ii) The penalty shall be payable to U.S. Environmental Protection Agency, NCP Fund, P.O. Box 360277M, Pittsburgh, PA 15251, except as provided in paragraph (g)(1)(iii) of this section.

(iii) Payment of a portion of the amount due each quarter under this section for any vehicle(s) or engine(s) is waived equal to the amount which the manufacturer has paid the State of California as a nonconformance penalty for nonconforming vehicle(s) or engine(s) titled, registered or principally used in the State of California, provided a waiver of Federal preemption under section 209(b) of the Clean Air Act permitting the State of California to collect NCPs for those vehicle(s) or engine(s) is approved by the Administrator. The nonconformance penalty for which payment is waived by EPA and due to the State of California shall be payable in accordance with California regulations and is calculated for each engine or vehicle subclass as follows:

$$W_{q,n}=(Cal_{q,n})(NCP_n)$$

where:

n = Index representing the number of model years for which the NCP has been available (same as "n" in paragraph (a)(4).

q = calendar quarter for which an NCP payment is due.

$W_{q,n}$ = waivered portion of the NCP payment for calender quarter q of year n.

$Cal_{q,n}$ = number of engines or vehicles of the subclass titled, registered or principally used in the State of California during calendar quarter q of year n.

NCP_n = the NCP for year n for the subclass (same as "NCP $_n$" in paragraph (a) (4)).

(iv) EPA reserves the right to collect any nonconformance penalties previously waived under paragraph (g)(1)(iii) of this section if:

(A) The manufacturer has not adequately demonstrated that it has paid the amount due to California for any quarter; or

(B) The payment by the manufacturer to California is less than that which would be due to EPA for the number of HDVs titled, registered or principally used in California in that quarter; or

(C) The manufacturer has not adequately demonstrated that all vehicles claimed to have been titled, registered or principally used in the State of California were in fact titled, registered or principally used in the State of California.

(v)(A) In the situation described in paragraph (g)(1)(iv)(A) of this section, EPA reserves the right to collect the entire NCP amount assessed under this subpart.

(B) In the situations described in paragraphs (g)(1)(iv)(B) and (C) of this section, EPA reserves the right to collect the difference between the amount that is due to EPA for the vehicles in question and the lesser amount (if any) paid to the State of California.

(C) A statement on the emissions label required under Subpart A of 40 CFR Part 86 that the engine or vehicle is designated for title, registration or principal use only for the State of California will constitute adequate demonstration that the engine or vehicle was titled, registered or principally used in the State of California, for the purpose of this section. Other forms of demonstration that a vehicle was titled, registered or principally used in the State of California would be acceptable if the manufacturer submits a request for approval of an alternative demonstration plan to the Director, Manufacturers Operations Division, U.S. Environmental Protection Agency, EN-340F, Washington, DC 20460, and if that request is approved prior to the production of such vehicles.

(2) When a manufacturer has requested a hearing under § 86.1115-87, it must pay the nonconformance penalty, and any interest, within ten days after the Presiding Officer renders his decision, unless the manufacturer first files a notice of intention to appeal to the Administrator pursuant to § 86.1115-87(t)(1), or, if an appeal of the Presiding Officer's decision is taken, within ten days after the Administrator renders his decision, unless the manufacturer first files a petition for judicial review.

(3) A manufacturer making payment under paragraph (g)(1) or (g)(2) of this section shall submit the following information by each quarterly due date to: Director, Manufacturers Operations Division (EN-340F), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460.

The following information shall also accompany each payment:

(i) Corporate identification, identification and quantity of engines or vehicles subject to the NCP, identification and quantity and proof of title, registration or principal use in the State of California for any engines or vehicles subject to California NCPs and documentation of the NCP paid to the State of California under paragraph (g)(1)(iii) of this section, certificate identification (number and date), and NCP payment calculations, if applicable.

(ii) The following statement and endorsement:

> This information is submitted pursuant to section 206 of the Clean Air Act. All information reported herein is, to the best of
>
> ______________________________'s
>
> (Company name)
>
> knowledge, true and accurate. I am aware of the penalties associated with violations of the Clean Air Act and the regulations thereunder.
>
> ______________________________
>
> (Authorized Company Representative)

(4) The Administrator may verify the production figures or other documentation submitted under paragraph (g)(3) of this section.

(h) A manufacturer that certifies as a replacement for the nonconforming configuration, a configuration that is in conformance with applicable standards, and that performs a production compliance audit (PCA) in accordance with § 86.1112-87(a) that results in a compliance level below the applicable standard, will be eligible to receive a refund of a portion of the engineering and development component of the penalty. The engineering and development component will be determined by multiplying the base penalty amount by the engineering and development factor for the appropriate subclass and pollutant in § 86.1105-87. The amount refunded will depend on the model year in which the certification and PCA take place. In cases where payment of penalties have been waived by EPA in accordance with paragraph (g)(1)(iii) of this section, EPA will refund a portion of the engineering and development component. The proportionate refund to be paid by EPA will be based on the proportion of vehicles or engines of the nonconforming configuration for which NCPs were paid to EPA. The refund is calculated as follows:

$R_{tot}=D_n\times F_{E\&D}\times NCP_1\times Prod_{tot}$

$R_{Cal}=(Prod_{Cal}/Prod_{tot})\times(R_{tot})$

$R_{EPA}=R_{tot}-R_{Cal}$

Where:

n = index representing the number of model years for which the NCP has been available for an engine or vehicle subclass (i.e., n=1 for the first year that NCPs are available, ... n=n for the n^{th} year the NCPs are available; same as "n" in paragraph (a)(4)).

D_n = discount factor depending on the number of model years (n) for which NCPs were available at the time of certification and PCA of the replacement configuration, and its value is as follows:

$D_1=0.90$

$D_2=0.79$

$D_3=0.67$

$D_4 = 0.54$
$D_5 = 0.39$
$D_6 = 0.23$
$D_7 = 0.05$
$D_n = 0.00$ for $n = 8$ or larger

$F_{E,D}$=the engineering and development factor specified in section 86.1105-87 for the appropriate subclass and pollutant

NCP_1=the penalty for each engine or vehicle during the first (base) year the NCP is available as calculated in paragraph (a)

$Prod_{tot}$=total number of engines or vehicles produced in the subclass for which NCPs were paid to EPA or to the State of California

$Prod_{Cal}$=number of engines or vehicles in the subclass demonstrated to have beer titled, registered or principally used in the State of California and for which NCPs were paid to the State of California under paragraph (g)(1)

R_{tot}=Total refund due to the manufacturer for the engineering and development component of the NCP

R_{Cal}=Refund due to the manufacturer from the State of California for the engineering and development component of the NCP

R_{EPA}=Refund due to the manufacturer from EPA for the engineering and development component of the NCP.

[50 FR 35388, Aug. 30, 1985, as amended at 50 FR 53467, Dec. 31, 1985; 53 FR 19134, May 26, 1988]

§ 86.1114-87 Suspension and voiding of certificates of conformity.

(a) The certificate of conformity is suspended with respect to any engine or vehicle failing pursuant to paragraph (f) of § 86.1112-87 effective from the time that a fail decision is made for that engine or vehicle.

(b) Once a certificate has been suspended for a failed engine or vehicle as provided for in paragraph (a) of this section, the manufacturer shall take the following actions:

(1) Before the certificate is reinstated for that failed engine or vehicle,

(i) Remedy the nonconformity, and

(ii) Demonstrate that the engine or vehicle conforms to the applicable standards or compliance levels by retesting the engine or vehicle in accordance with these regulations; and

(2) Submit a written report to the Administrator within five working days after successful completion of testing on the failed engine or vehicle, which contains a description of the remedy and test results for each engine or vehicle in addition to other information that may be required by this regulation.

(c) The Administrator may suspend the certificate of conformity if the manufacturer, after electing to conduct a PCA, fails to adhere to the requirements stated in § 86.1106-87(b)(3), (b)(6)(iii), (c)(2), or (c)(5)(iii).

(d) The Administrator may suspend the qualified certificate of conformity issued under the conditions specified in § 86.1106-87 if the manufacturer fails to adhere to the requirements stated in § 86.1106-87(a)(3), (a)(4)(iii), (d)(2)(iii), or (d)(3).

(e) The Administrator may suspend the certificate of conformity or the qualified certificate of conformity if the compliance level as determined in § 86.1112-87(a) is in excess of the upper limit.

(f) The Administrator may void the certificate of conformity if the compliance level as determined in § 86.1112-87(a) is in excess of the upper limit and the manufacturer fails to recall any engines or vehicles introduced into commerce pursuant to § 86.1106-87(a)(4)(ii), (b)(6)(ii), (c)(5)(ii) or (d)(2)(ii).

(g) The Administrator may void the certificate of conformity for those engines or vehicles for which the manufacturer fails to meet the requirements of § 86.1106-87(a)(4)(i), (b)(6)(i), (c)(5)(i), or (d)(2)(i).

(h) The Administrator shall notify the manufacturer in writing of any suspension or voiding of a certificate of conformity in whole or in part, except as provided for in paragraph (a) of this section.

(i) A certificate of conformity suspended or voided under paragaph (c), (d), (e), (f) or (g) of this section may be reinstated after a written request by the manufacturer and under such terms and conditions as the Administrator may require and after the manufacturer demonstrates compliance with applicable requirements.

(j) After the Administrator suspends or voids a certificate of conformity pursuant to this section or notifies a manufacturer of his intent to suspend or void a certificate of conformity under § 86.087-30(e), and prior to the commencement of a hearing, if any, under § 86.1115-87, if the manufacturer demonstrates to the Administrator's satisfaction that the decision to suspend or void the certificate was based on erroneous information, the Administrator shall reinstate the certificate.

§ 86.1115-87 Hearing procedures for nonconformance determinations and penalties.

(a) *Applicability.* The procedures prescribed by this section shall apply whenever a manufacturer requests a hearing pursuant to § 86.087-30(e)(6)(i), § 86.087-30(e)(7), or § 86.1113-87(f).

(b) *Definitions.* The following definitions shall be applicable to this section:

(1) "Hearing Clerk" shall mean the Hearing Clerk of the Environmental Protection Agency.

(2) "Manufacturer" means a manufacturer contesting a compliance level or penalty determination sent to the manufacturer.

(3) "Party" means the Agency and the manufacturer.

(4) "Presiding Officer" shall mean an Administrative Law Judge appointed pursuant to 5 U.S.C. 3105 (see also 5 CFR Part 930 as amended).

(5) "Judicial Officer" shall mean an officer or employee of the Agency appointed as a Judicial Officer by the Administrator pursuant to this section who shall meet the qualifications and perform functions as follows:

(i) *Officer.* There may be designated for purposes of this section one or more Judicial Officers. As work requires, there may be a Judicial Officer designated to act for the purposes of a particular case.

(ii) *Qualifications.* A Judicial Officer may be a permanent or temporary employee of the Agency who performs other duties for the Agency. Such Judicial Officer shall not be employed by the Office of Air and Radiation or have any connection with the preparation or presentation of evidence for a hearing held pursuant to this subpart.

(iii) *Functions.* The Administrator may consult with a Judicial Officer or delegate all or part of his authority to act in a given case under this section to a Judicial Officer, *Provided,* That this delegation shall not preclude the Judicial Officer from referring any motion or case to the Administrator when the Judicial Officer determines such referral to be appropriate.

(c) *Request for public hearing.* (1) A manufacturer may request a hearing pursuant to § 86.1113-87(f) if it disagrees with the Administrator's determination of compliance level or penalty calculation or both, or pursuant to § 86.085-30(e)(6)(i) or § 86.085-30(e)(7) if it disagrees with the Administrator's proposed suspension or voiding of a certificate of conformity. Requests for such a hearing shall be filed no later than 15 days:

(i) After receipt of the Administrator's notification of NCP, if the compliance level is in the allowable range of non-conformity, or

(ii) After completion of the Production Compliance Audit, if the compliance level exceeds the upper limit, or

(iii) After receipt of the Administrator's notification of a proposed suspension or voiding of a certificate of conformity if the hearing is requested pursuant to §§ 86.085-30(e)(6)(i) or 86.085-30(e)(7), unless otherwise specified by the Administrator. The manufacturer shall simultaneously serve two copies of this request upon the Director of the Manufacturers Operations Division and file two copies with the Hearing Clerk. Failure of the manufacturer to request a hearing within the time provided constitutes a waiver of the right to a hearing. Subsequent to the expiration of the period for requesting a hearing as of right, the Administrator may, in his discretion and for good cause shown, grant the manufacturer a hearing to contest the compliance level or penalty calculation.

(2) The request for a public hearing shall contain:

(i) A statement as to which vehicle or engine subclasses or configurations are to be the subject of the hearing;

(ii) A concise statement of the issues to be raised by the manufacturer at the hearing for each vehicle or engine subclass or configuration for which the manufacturer has requested the hearing. *Provided, however,* That in the case of a hearing requested under § 86.1113-87(f), the hearing shall be restricted to the following issues:

(A) Whether the compliance level was determined in accordance with the procedures in § 86.1112-87(a); or

(B) Whether the penalty was calculated in accordance with the procedures in § 86.1113-87(a).

(iii) A statement specifying reasons why the manufacturer believes it will prevail on the merits on each of the issues so raised; and

(iv) A summary of the evidence which supports the manufacturer's position on each of the issues so raised.

(3) A copy of all requests for public hearings shall be kept on file in the Office of the Hearing Clerk and shall be made available to the public during Agency business hours.

(d) *Summary decision.* (1) In the case of a hearing requested under § 86.1113-87(f) when it clearly appears from the data and other information contained in the request for a hearing that there is no genuine and substantial question of fact with respect to the issues specified in § 86.1115-87(c)(2)(ii), the Administrator will enter an order denying the request for a hearing, and reaffirming the original compliance level determination or penalty calculation.

(2) Any order issued under paragraph (d)(1) of this section shall have the force and effect of a final decision of the Administrator, as issued pursuant to paragraph (v)(4) of this section.

(3) If the Administrator determines that a genuine and substantial question of fact does exist with respect to any of the issues referred to in paragraph (d)(1) of this section, he shall grant the request for a hearing and publish a notice of public hearing in accordance with paragraph (h) of this section.

(e) *Filing and service.* (1) An original and two copies of all documents or papers required or permitted to be filed pursuant to this section shall be filed with the Hearing Clerk. Filing shall be deemed timely if mailed, as determined by the postmark to the Hearing Clerk within the time allowed by this section. If filing is to be accomplished by mailing, the documents shall be sent to the address set forth in the notice of public hearing as described in paragraph (h) of this section.

(2) To the maximum extent possible, testimony shall be presented in written form. Copies of written testimony shall be served upon all parties as soon as practicable prior to the start of the hearing. A certificate of service shall be provided on or accompany each document or paper filed with the Hearing Clerk. Documents to be served upon the Director of the Manufacturers Operations Division shall be sent by registered mail to: Director, Manufacturers Operations Division, U.S. Environmental Protection Agency (EN-340F), 401 M Street, SW., Washington, D.C. 20460. Service by registered mail is complete upon mailing.

(f) *Time.* (1) In computing any period of time prescribed or allowed by this section, except as otherwise provided, the day of the act or event from which the designated period of time begins to run shall not be included. Saturdays, Sundays, and Federal legal holidays shall be included in computing any such period allowed for the filing of any document or paper, except that when such a period expires on a Saturday, Sunday, or Federal legal holiday, such period shall be extended to include the next following business day.

(2) A prescribed period of time within which a party is required or permitted to do an act shall be computed from the time of service, except that when service is accomplished by mail, three days shall be added to the prescribed period.

(g)(1) *Consolidation.* The Administrator of the Presiding Officer in his discretion may consolidate two or more proceedings to be held under this section for the purpose of resolving one or more issues whenever it appears that such consolidation will expedite or simplify consideration of such issues. Consolidation shall not affect the right of any party to raise issues that could have been raised if consolidation had not occurred.

(2) If a vehicle or engine is determined to be in nonconformity during certification testing under Subpart A of this part, then the manufacturer may wait to challenge the determination until after production compliance auditing and calculation of his penalty and may consolidate challenges to the

determination of nonconformity and the compliance level determination or the penalty calculation, without losing any rights he would otherwise have had.

(3) If a vehicle or engine is determined to be in nonconformity during selective enforcement auditing under Subpart K of this part, then the manufacturer must wait to challenge the determination until after the compliance level determination and the penalty calculation, and must consolidate challenges to the determination of nonconformity and the compliance level determination or the calculation of the penalty.

(h) *Notice of public hearings.* (1) Notice of public hearing under this section shall be given by publication in the FEDERAL REGISTER and by such other means as the Administrator finds appropriate to provide notice to the public. To the extent possible, hearings under this section shall be scheduled to commence within 30 days of receipt of the application in paragraph (c) of this section.

(i) *Amicus curiae.* Persons not parties to the proceeding wishing to file briefs may do so by leave of the Presiding Officer granted on motion. A motion for leave shall identify the interest of the applicant and shall state the reasons why the proposed amicus brief is desirable.

(j) *Presiding Officer.* The Presiding Officer shall have the duty to conduct a fair and impartial hearing in accordance with 5 U.S.C. 554, 556 and 557 and to take all necessary action to avoid delay in the disposition of the proceedings and to maintain order. He shall have all power consistent with Agency rules and with the Administrative Procedure Act necessary to this end, including the following:

(1) To administer oaths and affirmations;

(2) To rule upon offers of proof and exclude irrelevant or repetitious material;

(3) To regulate the course of the hearings and the conduct of the parties and their counsel therein;

(4) To hold conferences for simplification of the issues or any other proper purpose;

(5) To consider and rule upon all procedural and other motions appropriate in such proceedings;

(6) To require the submission of direct testimony in written form with or without affidavit whenever, in the opinion of the Presiding Officer, oral testimony is not necessary for full and true disclosure of the facts;

(7) To enforce agreements and orders requiring access as authorized by law;

(8) To require the filing of briefs on any matter on which he is required to rule;

(9) To require any party or any witness, during the course of the hearing, to state his position on any issue;

(10) To take or cause depositions to be taken whenever the ends of justice would be served thereby;

(11) To make decisions or recommend decisions to resolve the disputed issues on the record of the hearing;

(12) To issue, upon good cause shown, protective orders as described in paragraph (n) of this section.

(k) *Conferences.* (1) At the discretion of the Presiding Officer, conferences may be held prior to or during any hearing. The Presiding Officer shall direct the Hearing Clerk to notify all parties of the time and location of such conference. At the discretion of the Presiding Officer, persons other than parties may attend. At a conference the Presiding Officer may:

(i) Obtain stipulations and admissions, receive requests and order depositions to be taken, identify disputed issues of fact and law, and require or allow the submission of written testimony from any witness or party;

(ii) Set a hearing schedule for as many of the following as are deemed necessary by the Presiding Officer:

(A) Oral and written statements;

(B) Submission of written direct testimony as required or authorized by the Presiding Officer;

(C) Oral direct and cross-examination of a witness where necessary as prescribed in paragraph (p) of this section; and

(D) Oral argument, if appropriate.

(iii) Identify matters of which official notice may be taken;

(iv) Consider limitation of the number of expert and other witnesses;

(v) Consider the procedure to be followed at the hearing; and

(vi) Consider any other matter that may expedite the hearing or aid in the disposition of the issue.

(2) The results of any conference including all stipulations shall, if not transcribed, be summarized in writing by the Presiding Officer and made part of the record.

(l) *Primary discovery (exchange of witness lists and documents).* (1) At a prehearing conference or within some reasonable time set by the Presiding Officer prior to the hearing, each party shall make available to the other parties the names of the expert and other witnesses the party expects to call, together with a brief summary of their expected testimony and list of all documents and exhibits which the party expects to introduce into evidence. Thereafter, witnesses, documents, or exhibits may be added and summaries of expected testimony amended upon motion by a party.

(2) The Presiding Officer, may upon motion by a party or other person, and for good cause shown, by order

(i) Restrict or defer disclosure by a party of the name of a witness or a narrative summary of the expected testimony of a witness, and

(ii) Prescribe other appropriate measures to protect a witness. Any party affected by any such action shall have an adequate opportunity, once he learns the name of a witness and obtains the narrative summary of this expected testimony, to prepare for the presentation of this case.

(m) *Other discovery.* (1) Except as provided by paragraph (m)(1) of this section, further discovery under this paragraph shall be permitted only upon determination by the Presiding Officer:

(i) That such discovery will not in any way unreasonably delay the proceeding;

(ii) That the information to be obtained is not obtainable voluntarily; and

(iii) That such information has significant probative value. The Presiding Officer shall be guided by the procedures set forth in the Federal Rules of Civil Procedure, where practicable, and the precedents thereunder, except that no discovery shall be undertaken except upon order of the Presiding Officer or upon agreement of the parties.

(2) The Presiding Officer shall order depositions upon oral questions only upon a showing of good cause and upon a finding that:

(i) The information sought cannot be obtained by alternative methods; or

(ii) There is a substantial reason to believe that relevant and probative evidence may otherwise not be preserved for presentation by a witness at the hearing.

(3) Any party to the proceeding desiring an order of discovery shall make a motion or motions therefor. Such a motion shall set forth:

(i) The circumstances warranting the taking of the discovery;

(ii) The nature of the information expected to be discovered; and

(iii) The proposed time and place where it will be taken. If the Presiding Officer determines the motion should be granted, he shall issue an order for the taking of such discovery together with the conditions and terms thereof.

(4) Failure to comply with an order issued pursuant to this paragraph may lead to the inference that the information to be discovered would be adverse to the person or party from whom the information was sought.

(n) *Protective orders, in camera proceedings.* (1) Upon motion by a party or by the person from whom discovery is sought, and upon a showing by the movant that the disclosure of the information to be discovered, or a particular part thereof (other than emission data), would result in methods or processes entitled to protection as trade secrets of the person being divulged, the Presiding Officer may enter a protective order with respect to such material. Any protective order shall contain such terms governing the treatment of the information as may be appropriate under the circumstances to prevent disclosure outside the hearing, *provided* that the order shall state that the material shall be filed separately from other evidence and exhibits in the hearing. Disclosure shall be limited to parties to the hearing, their counsel and relevant technical consultants, and authorized representatives of the United States concerned with carrying out the Act. Except in the case of the government, disclosure may be limited to counsel for parties who shall not disclose such information to the parties themselves. Except in the case of the government, disclosure to a party or his counsel shall be conditioned on execution of a sworn statement that no disclosure of the information will be made to persons not entitled to receive it under the terms of the protective order. (No such provision is necessary where government employees are concerned because disclosure by them is subject to the terms of 18 U.S.C. 1905.)

(2)(i) A party or person seeking a protective order may be permitted to make all or part of the required showing in camera. A record shall be made of such in camera proceedings. If the Presiding Officer enters a protective order following a showing in camera, the record of such showing shall be sealed and preserved and made available to the Agency or court in the event of appeal.

(ii) Attendance at any in camera proceeding may be limited to the Presiding Officer, representatives of the Agency, and the person or party seeking the protective order.

(3) Any party, subject to the terms and conditions of any protective order issued pursuant to paragraph (n)(1) of this section, that desires to make use of any in camera documents or testimony in the presentation of his case shall apply to the Presiding Officer by motion for permission to do so, and shall state the justification for the motion. The Presiding Officer, in granting any such motion, shall enter an order protecting the rights of the affected persons and parties as far as is practicable, and preventing unnecessary disclosure of such information and testimony concerning such information.

(4) In the submittal of proposed findings, briefs, or other papers, counsel for all parties shall make a good faith attempt to refrain from disclosing the specific details of in camera documents and testimony. This shall not preclude references in such proposed findings, briefs, or other papers to such documents or testimony. This shall not preclude references in such proposed findings, briefs, or other papers marked "confidential," which shall become part of the in camera record.

(o) *Motions.* (1) All motions, except those made orally during the course of the hearing, shall be in writing and shall state with particularity the grounds therefore, shall set forth the relief or order sought, and shall be filed with the Hearing Clerk and served upon all parties.

(2) Within such time as may be fixed by the Administrator, the judicial officer, or the Presiding Officer, as appropriate, any party may serve and file an answer to the motion. The motion shall, if requested by the Administrator, the judicial officer, or the Presiding Officer, as appropriate, serve and file reply papers, within the time set by the request.

(3) The Presiding Officer shall rule upon all motions filed or made prior to the filing of his decision or accelerated decision, as appropriate. The Administrator of the judicial officer, as appropriate, shall rule upon all motions filed prior to the appointment of a Presiding Officer and all motions filed after the filing of the decision of the Presiding Officer or accelerated decision. Oral argument of motions will be permitted only if the Presiding Officer, the Administrator or the judicial officer, as appropriate, deems it necessary.

(p) *Evidence.* (1) The official transcripts and exhibits, together with all papers and requests filed in the proceeding, shall constitute the record. Immaterial or irrelevent parts of an admissible document shall be segregated and excluded so far as practicable. Documents or parts thereof subject to a protective order under paragraph (n) of this section shall be segregated. Evidence may be received at the hearing even though inadmissible under the rules of evidence applicable to judicial proceedings. The weight to be given evidence shall be determined by its reliability and probative value.

(2) The Presiding Officer shall allow the parties to examine and cross-examine a witness to the extent that such examination and cross-examination is necessary for a full and true disclosure of the facts.

(3) Rulings of the Presiding Officer on the admissibility of evidence, the propriety of examination and cross-examination and other procedural matters shall appear in the record.

(4) Parties shall automatically be presumed to have taken exception to an adverse ruling.

(q) *Record.* (1) Hearings shall be stenographically reported and transcribed and the original transcripts shall be part of the record. Copies of the records shall be filed with the Hearing Clerk and made available during Agency business hours for public inspection. Any person who wants a copy of the record of the hearing or any part thereof, except as provided in paragraph (n) of this section, shall be entitled to the same upon payment of the cost thereof.

(2) The official transcripts and exhibits, together with all papers and requests filed in the proceeding, shall constitute the record.

(r) *Proposed findings, conclusions.* (1) Within 30 days of the close of the reception of evidence, or within such longer time as may be fixed by the Presiding Officer, any party may submit for the consideration of the Presiding Officer proposed findings of fact, conclusions of law, and a proposed order, together with reasons therefore and briefs in support thereof. Such proposals shall be in writing, shall be served upon all parties, and shall contain adequate references to the record and authorities relied upon.

(2) The record shall show the Presiding Officer's ruling on the proposed findings and conclusions except when his order disposing of the proceeding otherwise informs the parties of the action taken by him.

(s) *Decision of the Presiding Officer.* (1) Unless extended by the Administrator, the Presiding Officer shall issue and file with the Hearing Clerk his decision within 30 days after the period for filing proposed findings has expired, as provided for in paragraph (r) of this section.

(2) The Presiding Officer's decision shall become the decision of the Administrator (i) 10 days after issuance thereof, if no notice of intention to appeal as described in paragraph (t) of this section is filed, unless in the interim the Administrator shall have taken action to review or stay the effective date of the decision; or (ii) 5 days after expiration of the period allowed by paragraph (t)(1) of this section for perfection of an appeal, if a notice of intention to appeal is filed but the appeal is not perfected, unless within that 5 day period the Administrator shall have taken action to review or stay the effective date of the decision;

(3) The Presiding Officer's decision shall include a statement of findings and conclusions, as well as the reasons or basis therefore, upon all the material issues of fact or law presented on the record and an appropriate rule or order. Such decision shall be supported by substantial evidence and based upon a consideration of the whole record.

(4) At any time prior to the issuance of his decision, the Presiding Officer may reopen the proceeding for the reception of further evidence. Except for the correction of clerical errors, the jurisdiction of the Presiding Officer is terminated upon the issuance of his decision.

(t) *Appeal from the decision of the Presiding Officer.* (1) Any party to a proceeding may appeal the Presiding Officer's decision to the Administrator, *provided* that within 10 days after issuance of the Presiding Officer's decision such party files a notice of intention to appeal and an appeal brief within 20 days of such decision.

(2) When an appeal is taken from the decision of the Presiding Officer, any party may file a brief with respect to such appeal. The brief shall be filed within the same time limits as the appellant's brief.

(3) Any brief filed pursuant to this paragraph shall contain in the order indicated, the following:

(i) A subject index of the matter in the brief, with page references, and a table of cases (alphabetically arranged), textbooks, statutes, and other material cited, with page references thereto;

(ii) A specification of the issues intended to be appealed;

(iii) The argument, presenting clearly the points of fact and law relied upon in support of the position taken on each issue, with specific page references to the record and legal or other material relied upon; and

(iv) A proposed order for the Administrator's consideration if different from the order contained in the Presiding Officer's decision.

(4) No brief in excess of 15 pages shall be filed without leave of the Administrator.

(5) Oral argument will be allowed only in the discretion of the Administrator.

(u) *Review of the Presiding Officer's decision in absence of appeal.* (1) If, after the expiration of the period for taking an appeal as provided for by paragraph (t) of this section, no notice of intention to appeal the decision of the Presiding Officer has been filed, or if filed, not perfected, the Hearing Clerk shall so notify the Administrator.

(2) The Administrator, upon receipt of notice from the Hearing Clerk that no notice of intention to appeal has been filed, or if filed, not perfected pursuant to paragraph (t)(1) of this section, may, on his own motion, within 14 days after notice from the Hearing Clerk, review the decision of the Presiding Officer. Notice of the intention of the Administrator to review the decision of the Presiding Officer shall be given to all parties and shall set forth the scope of such review and the issues which shall be considered and shall make provisions for filing of briefs.

(v) *Decision of appeal or review.* (1) Upon appeal from or review of the Presiding Officer's decision, the Administrator shall consider such parts of the record as are cited or as may be necessary to resolve the issues presented and in addition shall, to the extent necessary or desirable, exercise all the powers which he could have exercised if he had presided at the hearing.

(2) In rendering his decision, the Administrator shall adopt, modify or set aside the findings, conclusions, and order contained in the decision of the Presiding Officer and shall set forth in his decision a statement of the reasons or bases for this action.

(3) In those cases where the Administrator believes that he should have further information or additional views of the parties as to the form and content of the rule or order to be issued, the Administrator, in his discretion, may withhold final action pending the receipt of such additional information or views, or may remand the case to the Presiding Officer.

(4) Any decision rendered under this paragraph which completed disposition of a case shall be a final decision of the Administrator.

(w) *Reconsideration.* Any party may file with the Administrator a petition for reconsideration of such decision, setting forth the relief desired and the grounds in support thereof. This petition must be filed within 20 days of the issuance of the Administrator's decision, and must be confined to new questions raised by the decision or final order and which the petitioner had no opportunity to argue before the Presiding Officer or the Administrator, unless otherwise specified by the Administrator. Subsequent to the expiration of the period for petitioning for reconsideration, the Administrator may, in his descretion and for good cause shown, grant the manufacturer a hearing to contest the compliance level or the penalty calculation even though such issues may have been raised in the previous proceeding. Any party desiring to oppose such a petition, shall file an answer thereto within 10 days after the filing of the petition. The filing of a petition for reconsideration shall not operate to stay the effective date of the decision or order or to toll the running of any statutory time period affecting such decision or order unless specifically so ordered by the Administrator.

(x) *Accelerated decision, dismissal.* (1) The Presiding Officer, upon motion of any party or sua sponte may at any time render an accelerated decision in favor of the Agency or the manufacturer as to all or any part of the proceeding, without further hearing or upon such limited additional evidence such as affidavits as he may require, or dismiss any party with prejudice, for any of the following reasons:

(i) Failure to state a claim upon which relief can be granted, or direct or collateral estoppel;

(ii) The lack of any genuine issue of material fact, causing a party to be entitled to judgment as a matter of law; or

(iii) Such other and further reasons as are just, including specifically, failure to obey a procedural order of the Presiding Officer.

(2) If under this paragraph an accelerated decision is issued as to all the issues and claims joined in the proceeding, the decision shall be treated for the purposes of these procedures as the decision of the Presiding Officer, as provided in paragraph (s) of this section.

(3) If under this paragraph, judgment is rendered on less than all issues or claims in the proceeding, the Presiding Officer shall determine what material facts exist without substantial controversy and what material facts are actually and in good faith controverted. He shall thereupon issue an order specifying the facts which appear without substantial controversy, and the issues and claims upon which the hearing will proceed.

(y) *Conclusion of hearing.* (1) If, after the expiration of the period for taking an appeal as provided by paragraph (t) of this section, no appeal has been taken from the Presiding Officer's decision, and after the expiration of the period for review by the Administrator on his own motion as provided for by paragraph (u) of this section, the Administrator does not move to review such decision, the hearing will be deemed to have ended at the expiration of all periods allowed for such appeal and review.

(2) If an appeal of the Presiding Officer's decision is taken pursuant to paragraph (t) of this section, or if, in the absence of such appeal the Administrator moves to review the decision of the Presiding Officer pursuant to paragraph (u) of this section, the hearing will be deemed to have ended upon issuance of a final decision by the Administrator.

(z) *Interest on NCPs.* (1) Interest shall be assessed on any nonconformance penalty for which payment has been withheld pursuant to § 86.1113-87(g)(2). Interest shall be calculated from the due date for the first quarterly NCP payment, as determined under § 86.1113-87(g)(1), until the date on which the Presiding Officer or the Administrator renders the final decision of the Agency.

(2) The combined principal plus interest on each quarterly NCP payment withheld pursuant to § 86.1113-87(g)(2) shall be calculated according to the following formula:

where: $QNCP\ (1+R)^{.25n}$

QNCP = the quarterly NCP payment
R = the interest rate applicable to that quarter
n = the number of quarters for which the quarterly NCP payment is outstanding

(3) The number of quarters for which payment is outstanding for purposes of this paragraph shall be the number of quarterly NCP payment due dates, as determined under § 86.1113-87(g)(1), which have elapsed before the decision of the Agency under this section.

(4) The interest rate applicable to a quarter for purposes of this paragraph shall be the coupon issue yield equivalent (as quoted by the Secretary of the Treasury) of the average accepted auction price for the last auction of twenty-six week United States Treasury bills settled immediately prior to the quarterly NCP payment due date on which the payment was originally due.

(aa) *Judicial review.* (1) The Administrator hereby designates the General Counsel of the Environmental Protection Agency as the officer upon whom any copies for judicial review shall be served. Such officer shall be responsible for filing in the court the record on which the order of the Administrator is based.

[50 FR 35388, Aug. 30, 1985, as amended at 50 FR 53467, Dec. 31, 1985]

§ 86.1116-87 Treatment of confidential information.

(a) Any manufacturer may assert that some or all of the information submitted pursuant to this subpart is entitled to confidential treatment as provided by 40 CFR Part 2, Subpart B.

(b) Any claim of confidentiality must accompany the information at the time it is submitted to EPA.

(c) To assert that information submitted pursuant to this subpart is confidential, a manufacturer must indicate clearly the items of information claimed confidential by marking, circling, bracketing, stamping, or otherwise specifying the confidential information. Furthermore, EPA requests, but does not require, that the submitter also provide a second copy of its submittal from which all confidential information has been deleted. If a need arises to publicly release nonconfidential information, EPA will assume that the submitter has accurately deleted the confidential information from this second copy.

(d) If a claim is made that some or all of the information submitted pursuant to this subpart is entitled to confidential treatment, the information covered by that confidentiality claim will be disclosed by the Administrator only to the extent and by means of the procedures set forth in Part 2, Subpart B, of this chapter.

(e) Information provided without a claim of confidentiality at the time of submission may be made available to the public by EPA without further notice to the submitter, in accordance with 40 CFR 2.204(c)(2)(i)(A).

[50 FR 34798, Aug. 27, 1985]

Subpart M—Evaporative Emission Test Procedures for New Gasoline-Fueled and Methanol-Fueled Heavy-Duty Vehicles

AUTHORITY: Secs. 202, 206, 301, Clean Air Act as amended, 42 U.S.C. 7521, 7525, 7601.

SOURCE: 48 FR 1456, Jan. 12, 1983, unless otherwise noted.

§ 86.1201-85 Applicability.

(a) The provisions of this subpart are applicable to new gasoline-fueled heavy-duty vehicles.

(b) Provisions of this subpart apply to tests performed by both the Administrator and motor vehicle manufacturers.

(c) Test procedures and equipment other than those described in this subpart may be used by the vehicle manufacturer if shown to yield results which correlate with results yielded by those described in this subpart (with the reference driving schedule described in § 86.1215-85(a)) and if approved in advance by the Administrator.

§ 86.1201-90 Applicability.

(a) The provisions of this subpart are applicable to new gasoline-fueled and methanol-fueled heavy-duty vehicles.

(b) Provisions of this subpart apply to tests performed by both the Administrator and motor vehicle manufacturers.

(c) Test procedures and equipment other than those described in this subpart may be used by the vehicle manufacturer if shown to yield results which correlate with results yielded by those described in this subpart (with the reference driving schedule described in § 86.1215-85(a)) and if approved in advance by the Administrator.

[54 FR 14562, Apr. 11, 1989]

§ 86.1202-85 Definitions

Applicable definitions in §§ 86.077-2, 86.078-2, 86.079-2, 86.080-2, 86.081-2, 86.082-2 and 86.085-2 apply to this subpart.

§ 86.1203-85 Abbreviations.

The abbreviations in § 86.079-3 apply to this subpart.

§ 86.1205-85 Introduction; structure of subpart.

(a) This subpart describes the equipment required and the procedures to follow in order to determine evaporative emission levels from gasoline-fueled heavy-duty vehicles.

(b) Three topics are addressed in this subpart. Sections 86.1206-85 through 86.1215-85 set forth specifications and equipment requirements; §§ 86.1216-85 through 86.1226-85 discuss calibration methods and frequency; test procedures and data requirements are listed (in approximate order of performance) in §§ 86.1227-85 through 86.1245-85.

§ 86.1205-90 Introduction; structure of subpart.

(a) This subpart describes the equipment required and the procedures to follow in order to determine evaporative emission levels from gasoline-fueled and methanol-fueled heavy-duty vehicles.

(b) Three topics are addressed in this subpart. Sections 86.1206 through 86.1215 set forth specifications and equipment requirements; §§ 86.1216 through 86.1226 discuss calibration methods and frequency; test procedures and data requirements are listed (in approximate order of performance) in §§ 86.1227 through 86.1245.

[54 FR 14562, Apr. 11, 1989]

§ 86.1206-85 Equipment required; overview.

This subpart specifies procedures for testing of gasoline-fueled heavy-duty vehicles. Equipment required and specifications are as follows:

(a) *Evaporative emissions tests.* § 86.1207-85 specifies the necessary equipment.

(b) *Fuel, analytical gas, and driving schedule specifications.* Fuel specifications for emission testing and for service accumulation are specified in § 86.1213-85. Analytical gases are specified in § 86.1214-85. Both vehicle preconditioning for the diurnal loss test and vehicle operation prior to the hot soak loss test include operation on a chassis dynamometer. The driving cycle (EPA heavy-duty vehicle urban dynamometer driving schedule) is specified in § 86.1215-85.

§ 86.1206-90 Equipment required; overview.

This subpart specifies procedures for testing of gasoline-fueled and methanol-fueled heavy-duty vehicles. Equipment required and specifications are as follows:

(a) *Evaporative emissions tests.* § 86.1207 specifies the necessary equipment.

(b) *Fuel, analytical gas, and driving schedule specifications.* Fuel specifications for emission testing and for service accumulation are specified in § 86.1213. Analytical gases are specified in § 86.1214. Both vehicle preconditioning for the diurnal loss test and vehicle operation prior to the hot soak loss test include operation on a chassis dynamometer. The driving cycle (EPA heavy-duty vehicle urban dynamometer driving schedule) is specified in § 86.1215.

[54 FR 14562, Apr. 11, 1989]

§ 86.1207-85 Sampling and analytical system; evaporative emissions.

The following is a description of the components which will be used in evaporative emissions sampling systems for testing under this subpart.

(a) *Evaporative emission measurement enclosure.* The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.1217-81. Interior surfaces must be impermeable to hydrocarbons. At least one surface shall be constructed of flexible, impermeable material to allow for minor volume changes which result from temperature changes. No interior surface temperatures shall be less than 68°F (20°C).

(b) *Evaporative emission hydrocarbon analyzer.* A hydrocarbon analyzer utilizing the hydrogen flame ionization principle (FID) shall be used to monitor the atmosphere within the enclosure. Instrument bypass flow may be returned to the enclosure. The FID shall have a response time to 90 percent of final reading of less than 1.5 seconds, and be capable of meeting performance requirements expressed as a function of C_{std}, where C_{std} is the specific enclosure hydrocarbon level, in ppm, corresponding to the evaporative emission standard.

(1) Stability of the analyzer shall be better than 0.01 C_{std} ppm at zero and span over a 15-minute period on all ranges used.

(2) Repeatability of the analyzer, expressed as one standard deviation, shall be better than 0.005 C_{std} ppm on all ranges used.

(c) *Evaporative emission hydrocarbon date recording system.* The electrical output of the FID shall be recorded at least at the initiation and termination of each diurnal and hot soak. The recording may be by means of a strip chart potentiometric recorder, by use of an online computer system, or by other suitable means. In any case, the recording system must have operational characteristics (signal to noise ratio, speed of response, etc.) equivalent to or better than those of the signal source being recorded, and must provide a permanent record of results. The record shall show a positive indication of the initiation and completion of each soak.

(d) *Tank fuel heating system.* The tank fuel heating system shall consist of a heat source and a temperature controller. A typical heat source is a 2000 W heating pad. Other sources may be used as required by circumstances. The temperature controller may be manual, such as a variable voltage transformer, or may be automated. The heating system must not cause hot spots on the tank wetted surface which could cause local overheating of the fuel. Heat must not be applied to the vapor in the tank above the liquid fuel. The temperature controller must be capable of controlling the fuel tank temperature during the diurnal soak to within ±3°F (1.7°C) of the following equation:

$F=T_o+0.4t$

or for SI units:

$C=T_o+(2/9)t$

Where:
F=Temperature in °F
C=Temperature in °C
t=Time since start of test in minutes
T_o=Initial temperature in °F (or in °C for SI units)

(e) *Temperature recording system.* Strip chart recorder(s) or an automatic data processor shall be used to record enclosure ambient and vehicle fuel tank temperature at least once every minute. The temperature recorder or data processor shall have a time accuracy of ± 15s, a time precision of ± 15s and be capable of resolving temperature to ± 0.75°F (0.42°C). The temperature recording system (recorder and sensor) shall have an accuracy of ± 3°F (1.7°C). Two ambient temperature sensors, connected to provide one average output, shall be located in the enclosure. These sensors shall be located at the approximate vertical centerline of each side wall extending 4 inches (nominally) into the enclosure at a height of 3 ± 0.5 ft (0.9 + 0.2 m). The vehicle fuel tank temperature sensor shall be located in the fuel tank so as to measure the temperature of the prescribed test fuel at the approximate mid-volume of the fuel. Manufacturers shall arrange that vehicles furnished for testing at Federal certification facilities be equipped with iron-constantan Type J thermocouples for measurement of fuel tank temperature.

(f) *Purge blower.* One or more portable or fixed blowers shall be used to purge the enclosure. The blowers shall have sufficient flow capacity to reduce the inclosure hydrocarbon concentration from the test level to the ambient level between tests. Actual flow capacity will depend upon the time available between tests.

(g) *Mixing blower.* One or more blowers or fans with a total capacity of 250 to 750 cfm per 1000 ft ^{3} of enclosure volume shall be used to mix the contents of the enclosure during evaporative emission testing. The mixing blower(s) shall be arranged such that a uniform concentration is maintained. No portion of the air stream shall be directed towards the vehicle.

§ 86.1207–90 Sampling and analytical system; evaporative emissions.

The following is a description of the components which will be used in evaporative emissions sampling systems for testing under this subpart.

(a) *Evaporative emission measurement enclosure.* The enclosure shall be readily sealable, rectangular in shape with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.1217. Interior surfaces must be impermeable and non-reactive to hydrocarbons and to methanol (if used for methanol-fueled vehicles). One surface should be of flexible, impermeable and non-reactive material to allow for minor volume changes, resulting from temperature changes. Wall design should promote maximum dissipation of heat, and if artificial cooling is used, interior surface temperatures shall not be less than 68 °F (20 °C).

(b) *Evaporative emission hydrocarbon and methanol analyzers.* (1) For gasoline- and methanol-fueled vehicles a hydrocarbon analyzer utilizing the hydrogen flame ionization principle (FID) shall be used to monitor the atmosphere within the enclosure (a heated (235°±15 °F) (113°±8°)) flame ionization detector is required for methanol-fueled vehicles). Instrument bypass flow may be returned to the enclosure. The FID shall have a response time to 90 percent of final reading of less than 1.5 seconds, and be capable of meeting performance requirements expressed as a function of Cstd: where Cstd is the specific enclosure hydrocarbon level, in ppm, corresponding to the evaporative emission standard:

(i) Stability of the analyzer shall be better than 0.01 Cstd ppm at zero and span over a 15-minute period on all ranges used.

(ii) Repeatability of the analyzer, expressed as one standard deviation, shall be better than 0.005 Cstd ppm on all ranges used.

(2) For methanol-fueled vehicles, a methanol sampling and analyzing system is required in addition to the FID analyzer. The methanol sampling equipment shall consist of impingers for collecting the methanol sample and appropriate equipment for drawing the sample through the impingers. The analytical equipment shall consist of a gas chromatograph equipped with a flame ionization detector. (Note: For 1990 through 1994 model year methanol-fueled vehicles, a HFID, calibrated on methanol may be used in place of the HFID calibrated on propane plus the methanol impingers and associated analytical equipment.)

(c) *Evaporative emission hydrocarbon and methanol data recording system.* (1) The electrical output of the FID used for measuring hydrocarbons (or hydrocarbons plus methanol as appropriate) shall be recorded at least at the initiation and termination of each diurnal or hot soak. The recording may be by means of a strip chart potentiometric recorder, by use of an on-line computer system or other suitable means. In any case, the recording system must have operational characteristics (signal to noise ratio, speed of response, *etc.*) equivalent to or better than those of the signal source being recorded, and must provide a permanent record of results. The record shall show a positive indication of the initiation and completion of each diurnal or hot soak along with the time elapsed between initiation and completion of each soak.

(2) For the methanol sample, permanent records shall be made of the following: the volumes of deionized water introduced into each impinger, the rate and time of sample collection, the volumes of each sample introduced into the gas chromatograph, the flow rate of carrier gas through the column, the column temperature, and the chromatogram of the analyzed sample.

(d) *Tank fuel heating system.* The tank fuel heating system shall consist of a heat source and a temperature controller. A typical heat source is a 2,000 W heating pad. Other sources may be used as required by circumstances. The temperature controller may be manual, such as a variable voltage transformer, or may be automated. The heating system must not cause hot spots on the tank wetted surface which could cause local overheating of the fuel. Heat must not be applied to the vapor in the tank above the liquid fuel. The temperature controller must be capable of controlling the fuel tank temperature during the diurnal soak to within ±3 °F (±1.7 °C) of the following equation:

(1) $F=T_o+(0.4)t$

(2) *For SI units,* $C=T_o+(2/9)t$

Where:

F = Temperature in °F.

C = Temperature in °C.

t = Time since start of test in minutes.

T_o = Initial temperature in °F (or in °C for SI units).

(e) *Temperature recording system.* Strip chart recorder(s) or an automatic data processor shall be used to record enclosure ambient and vehicle fuel tank temperature at least once every minute. The temperature recorder or data processor shall have a time accuracy of ±15s, a time precision of ±15s and be capable of resolving temperature to ±0.75 °F (±0.42 °C). The temperature recording system (recorder and sensor) shall have an accuracy of ±3 °F (±1.7 °C). Two ambient temperature sensors, connected to provide one average output, shall be located in the enclosure. These sensors shall be located at the approximate vertical centerline of each side wall extending 4 inches (nominally) into the enclosure at a height of 3±0.5 ft (0.9±0.2 m). The vehicle fuel tank temperature sensor shall be located in the fuel tank so as to measure the temperature of the prescribed test fuel at the approximate mid-volume of the fuel. Manufacturers shall arrange that vehicles furnished for testing at Federal certification facilities be equipped with iron-constantan Type J thermocouples for measurement of fuel tank temperature.

(f) *Purge blower.* One or more portable or fixed blowers shall be used to purge the enclosure. The blowers shall have sufficient flow capacity to reduce the enclosure hydrocarbon and/or methanol concentration from the test level to the ambient level between tests. Actual flow capacity will depend upon the time available between tests.

(g) *Mixing blower.* One or more blowers or fans with a total capacity of 250 to 750 cfm per 1,000 ft³ of enclosure volume shall be used to mix the contents of the enclosure during evaporative emission testing. The mixing blower(s) shall be arranged such that a uniform concentration is maintained. No portion of the air stream shall be directed towards the vehicle.

[54 FR 14562, Apr. 11, 1989]

§ 86.1213-85 Fuel specifications.

(a) Gasoline having the following specifications will be used in emissions testing.

Item	ASTM	Leaded	Unleaded
Octane, research, minimum	D2699	98	93
Sensitivity, minimum		7.5	7.5
Lead (organic), grams/U.S. gallon		[1] 1.4	0.00–0.05
Distillation range:			
IBP, °F	D86	75–95	75–95
10 pct point, °F	D86	120–135	120–135
50 pct point, °F	D86	200–230	200–230
90 pct point, °F	D86	300–325	300–325
EP, °F (maximum)	D86	415	415
Sulphur, weight percent, maximum	D1266	0.10	0.10
Phosphorous, grams/U.S. gallon, maximum		0.01	0.005
RVP, pounds per square inch	D323	8.7–9.2	8.7–9.2
Hydrodcarbon composition:			
Olefins, percent maximum	D1319	10	10
Aromatics, percent maximum	D1319	35	3
Saturates	D1319	([2])	(

[1] Minimum.

[2] Remainder.

(b) Gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation. For leaded gasoline the minimum lead content shall be 1.4 grams per U.S. gallon, except that where the Administrator determines that vehicles represented by a test vehicle will be operated using gasoline of different lead content than that prescribed in this paragraph, he may consent in writing to use a gasoline with a different lead content. The octane rating of the gasoline used shall be no higher than 1.0 research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers, where sensitivity is defined as the research octane number minus the motor octane number. The Reid vapor pressure of the gasoline used shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(c) The specification range of the gasoline to be used under paragraph (b) of this section shall be recorded.

§ 86.1213-87 Fuel specifications.

(a) Gasoline having the following specifications will be used in emissions testing.

Item	ASTM	Leaded	Unleaded
Octane, research, min.	D2699	98	93
Sensitivity, min.		7.5	7.5
Lead (organic), g/U.S. gal. (g/liter).	D3237	[1]0.100 [1](0.026)	[1]0.050 (0.013
Distillation range:			
IBP, °F	D86	75–95	75-95
(°C)		(23.9–35)	(23.9-35
10 pct. point, °F.	D86	120–135	120-135
(°C)		(48.9–57.2)	(48.9-57.2
50 pct. point, °F.	D86	200–230	200-230

Item	ASTM	Leaded	Unleaded
(°C)		(93.3-110)	(93.3-110)
90 pct. point, °F.	D86	300-325	300-325
(°C)		(148.9-162.8)	(148.9-162.8)
EP, °F (max).	D86	415	415
(°C)		(212.8)	(212.8)
Sulphur, wt. pct., max.	D1266	0.10	0.10
Phosphorous, g/U.S. gal., max. (g/liter).		0.01 (0.0026)	0.005 (0.0013)
RVP, psi	D323	8.7-9.2	8.7-9.2
(kPa)		(60.0-63.4)	(60.0-63.4)
Hydrocarbon composition:			
Olefins, pct., max.	D1319	10	10
Aromatics, pct., max.	D1319	35	35
Saturates	D1319	(2)	(2)

[1] Maximum.
[2] Remainder.

(b)(1) Gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation.

(2) For leaded gasoline the lead content shall not exceed 0.100 gram per U.S. gallon, except that where the Administrator determines that vehicles represented by a test vehicle will be operated using gasoline of different lead content than that prescribed in this paragraph, he may consent in writing to use a gasoline with a different lead content.

(3) The octane rating of the gasoline used shall be no higher than 1.0 research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers, where sensitivity is defined as the Research octane number minus the Motor octane number.

(4) The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(c) The specification range of the gasoline to be used under paragraph (b) of this section shall be recorded.

[51 FR 24611, July 7, 1986]

§ 86.1213-90 Fuel specifications.

(a) Gasoline having the following specifications will be used in emissions testing for gasoline-fueled vehicles.

Item	ASTM	Value
Octane, research, min	D2699	93
Sensitivity, min		7.5
Lead (organic), g/U.S. gal	D3237	0.050[1]
(g/liter)		(0.013)[1]
Distillation range:		
IBP, °F	D86	75-95
(°C)		(23.9-35)
10 pct. point, °F	D86	120-135
(°C)		(48.9-57.2)
50 pct. point, °F	D86	200-230
(°C)		(93.3-110)
90 pct. point, °F	D86	300-325
(°C)		(148.9-162.8)
EP, max. °F	D86	415
(°C)		(212.8)
Sulphur, max. wt. pct	D1266	0.10
Phosphorous, max. g/U.S. gal	D3231	0.005
(g/liter)		(0.0013)
RVP, psi	D323	8.7-9.2
(kPa)		(60.0-63.4)
Hydrocarbon composition:		
Olefins, max. pct	D1319	10
Aromatics, max. pct	[illegible]	35
Saturates	D1319	[2]

[1] Maximum.
[2] Remainder.

(b)(1) Unleaded gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation.

(2) The octane rating of the gasoline used shall be no higher than 1.0 Research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers, where sensitivity is defined as the Research octane number minus the Motor octane number.

(3) The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(c) Methanol fuel used in evaporative emission testing and in service accumulation of methanol-fueled vehicles shall be representative of commercially available methanol fuel and shall consist of at least 50 percent methanol (CH_3OH) by volume.

(1) Manufacturers shall recommend the methanol fuel to be used for testing and service accumulation in ac-

cordance with paragraph (c) of this section.

(2) The Administrator shall determine the methanol fuel to be used for testing and service accumulation.

(d) Other methanol fuels may be used for testing and service accumulation provided:

(1) They are commercially available, and

(2) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(3) Use of a fuel listed under paragraph (c)(2) of this section would have a detrimental effect on emissions or durability, and

(4) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(e) The specification range of the fuels to be used under paragraphs (b), (c), and (d) of this section shall be reported in accordance with § 86.090-21(b)(3).

(f) *Mixtures of petroleum and methanol fuels for flexible fuel vehicles.* (1) Mixtures of petroleum and methanol fuels used for exhaust and evaporative emission testing and service accumulation for flexible fuel vehicles shall be within the range of fuel mixtures for which the vehicle was designed.

(2) Manufacturer testing and service accumulation may be performed using only those mixtures (mixtures may be different for exhaust testing, evaporative testing, and service accumulation) expected to result in the highest emissions, provided:

(i) The fuels which constitute the mixture will be used in customer service, and

(ii) Information, acceptable to the Administrator, is provided by the manufacturer to show that the designated fuel mixtures would result in the highest emissions, and

(iii) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(3) The specification range of the fuels to be used under paragraph (f)(2) of this section shall be reported in accordance with § 86.090-21(b)(3).

[53 FR 476, Jan. 7, 1988, as amended at 54 FR 14563, Apr. 11, 1989]

§ 86.1214-85 Analytical gases.

(a) *Analyzer gases.* (1) Gases for the hydrocarbon analyzer shall be single blends of propane using air as the diluent.

(2) Fuel for the evaporative emission enclosure FID shall be a blend of 40±2% hydrogen with the balance being helium. The mixture shall contain less than 1 ppm equivalent carbon response. 98 to 100 percent hydrogen fuel may be used with advance approval by the Administrator.

(3) The allowable zero air impurity concentration shall not exceed 1 ppm equivalent carbon response.

(4) "Zero grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

(5) The use of proportioning and precision blending devices to obtain the required analyzer gas concentrations is allowable provided their use has been approved in advance by the Administrator.

(b) Calibration gases shall be traceable to within ±1 percent of NBS gas standards.

(c) Span gases shall be accurate to within ±2 percent of true concentration, where true concentration refers to NBS gas standards.

§ 86.1215-85 EPA heavy-duty vehicle (HDV) urban dynamometer driving schedule.

(a) The EPA dynamometer driving schedule for heavy-duty vehicles is a 1060 second transient speed versus time cycle which is designed to simulate gasoline-fueled HDV operation in urban areas. A second by second listing of this schedule is given in Appendix I(d) of this part. Thirty-three percent of the cycle is idle operation, and the average vehicle speed is 18.9 mph (30.4 km/hr).

(b) The speed tolerance at any given time on the transient speed vs. time driving schedule is defined by upper and lower limits. The upper limit is 4 mph (6.4 km/hr) higher than the highest point on the trace within 1 second of the given time. The lower limit is 4 mph (6.4 km/hr) lower than the lowest point on the trace within 1 second of the given time. Speed variations greater than the tolerances (such as may occur during gear changes) are acceptable provided they occur for less than 2 seconds on any occasion. Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power during such occurrences.

(c) The Administrator will use this driving schedule when conducting evaporative emission tests.

§ 86.1216-85 Calibrations; frequency and overview.

(a) Calibrations shall be performed as specified in §§ 86.1217-85 through 86.1226-85.

(b) At least yearly or after any maintenance which could alter background emission levels, enclosure background emission measurements shall be performed.

(c) At least monthly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Calibrate the hydrocarbon analyzer (see § 86.1221-85).

(2) *Calibrate the dynamometer.* If the dynamometer receives a weekly performance check (and remains within calibration) the monthly calibration need not be performed (see § 86.1218-85).

(3) Perform a hydrocarbon retention check and calibration on the evaporative emission enclosure (see § 86.1217-85).

§ 86.1216-90 Calibrations; frequency and overview.

(a) Calibrations shall be performed as specified in § 86.1217 through § 86.1226.

(b) At least yearly or after any maintenance which could alter background emission levels, enclosure background emission measurements shall be performed.

(c) At least monthly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Calibrate the hydrocarbon analyzer and the methanol analyzer (see § 86.1221). Certain analyzers may require more frequent calibration depending on particular equipment and uses.

(2) Calibrate the dynamometer. If the dynamometer receives a weekly performance check (and remains within calibration) the monthly calibration need not be performed (see § 86.1218).

(3) Perform a hydrocarbon and, if applicable, a methanol retention check and calibration on the evaporative emission enclosure (see § 86.1217).

[54 FR 14564, Apr. 11, 1989]

§ 86.1217-85 Evaporative emission enclosure calibrations.

The calibration of the evaporative emission enclosure consists of three parts: Initial and periodic determination of enclosure background emissions; initial determination of enclosure internal volume; and periodic hydrocarbon retention check and calibration.

(a) *Initial and periodic determination of enclosure background emissions.* Prior to its introduction into service, annually thereafter, and after any repair which can affect the enclosure background emissions, the enclosure shall be checked to determine that it does not contain materials which will themselves emit hydrocarbons. Proceed as follows:

(1) Zero and span (calibrate if required) the hydrocarbon analyzer.

(2) Purge the enclosure until a stable background hydrocarbon reading is obtained.

(3) Turn on the mixing blower (if not already on).

(4) Seal enclosure and measure background hydrocarbon concentration, enclosure temperature, and barometric pressure. These are the initial readings C_{HCi}, T_i, and P_{Bi} for the enclosure background determination.

(5) Allow the enclosure to stand undisturbed without sampling for four hours.

(6) Measure the hydrocarbon concentration on the same FID. This is the final concentration, C_{HCf}. Also measure final temperature and barometric pressure.

(7) Calculate the mass change of hydrocarbons in the enclosure according

to the equations in paragraph (d) of this section. The enclosure background emissions shall not be greater than 0.4g for the 4 hours.

(b) *Initial determination of enclosure internal volume.* Prior to its introduction into service the enclosure internal volume shall be determined by the following procedure.

(1) Carefully measure the internal length, width and height of the enclosure, accounting for irregularities (such as braces, cooling system components, etc.) and calculate the internal volume.

(2) Perform an enclosure calibration check according to paragraphs (c) (1) through (7) of this section.

(3) If the calculated mass does not agree within ±2 percent of the injected propane mass, then corrective action is required.

(c) *Hydrocarbon retention check and calibration.* The hydrocarbon retention check provides a check upon the calculated volume and also measures the leak rate. Prior to its introduction into service and at least monthly thereafter the enclosure leak rate shall be determined as follows:

(1) Zero and span (calibrate if required) the hydrocarbon analyzer.

(2) Purge the enclosure until a stable background hydrocarbon reading is obtained.

(3) Turn on the mixing blower(s) (if not already on).

(4) Seal enclosure and measure background hydrocarbon concentration, temperature and barometric pressure. These are the initial readings (c_{HCi}, T_i and P_{Bi} for the enclosure calibration.

(5) Inject into the enclosure a known quantity of pure propane. (4g is a convenient quantity.) The propane may be measured by volume flow or by mass measurement. The method used to measure the propane shall have an accuracy and precision of ±0.5 percent of the measured value.

(6) After a minimum of 5 minutes of mixing, analyze the enclosure atmosphere for hydrocarbon content; also record temperature and pressure. These measurements are the final readings for the enclosure calibration as well as the initial readings for the retention check.

(7) To verify the enclosure calibration calculate the mass of propane using the measurements taken in steps (4) and (6) using the equations in paragraph (d) of this section. This quantity must be within ±2 percent of that measured in step (5) above.

(8) Allow the enclosure to remain sealed for a minimum of 4 hours without sampling and with the mixing blower(s) operating. After 4 hours analyze the enclosure atmosphere for hydrocarbon content; record temperature and barometric pressure. These are the final readings for the hydrocarbon retention check.

(9) Calculate the hydrocarbon mass using the equations in paragraph (d) of this section and the readings taken in (8). It may not differ by more than ±4 percent of the value in step (6).

(d) *Calculations.* The calculation of net hydrocarbon mass change is used to determine enclosure background and leak rate. It is also used to check the enclosure volume measurements. The mass change is calculated from the initial and final readings of hydrocarbon concentration, temperature and pressure according to the following equation:

$$M_{HC} = kV_n \times 10^{-4} \left(\frac{C_{HCf} P_{Bf}}{T_f} - \frac{C_{HCi} P_{Bi}}{T_i} \right)$$

where:

M_{HC} = Hydrocarbon mass change, g.

C_{HC} = Hydrocarbon concentration as ppm carbon.

V = Enclosure volume, ft^3 (m^3), as measured in paragraph (b)(1) of this section.

P_B = Barometric pressure, in. Hg (kPa).

T = Enclosure ambient temperature, R(K).

k = 3.05, for SI units k = 17.68.

i = Indicated initial reading.

f = Indicates final reading.

NOTE: Hydrocarbon concentration is stated in ppm carbon, that is, ppm propane x 3. Expressions in parentheses are for SI units.

§ 86.1217–90 Evaporative emission enclosure calibrations.

The calibration of the evaporative emission enclosure consists of three parts: Initial and periodic determination of enclosure background emissions (hydrocarbons and methanol); initial determination of enclosure internal volume; and periodic hydrocarbon and methanol retention check and calibration. Methanol measurements may be omitted when methanol-fueled vehicles will not be tested in the evaporative enclosure.

(a) *Initial and periodic determination of enclosure background emissions.* Prior to its introduction into service, annually thereafter, and after any repair which can affect the enclosure background emissions, the enclosure shall be checked to determine that it does not contain materials which will themselves emit hydrocarbons or methanol.[1] Proceed as follows:

(1) Zero and span (calibrate if required) the hydrocarbon analyzer.

(2) Purge the enclosure until a stable background hydrocarbon reading is obtained.

(3) Turn on the mixing blower (if not already on).

(4) Seal enclosure and measure background hydrocarbon concentration, background methanol, temperature, and barometric pressure. These are the initial readings C_{HCi}, C_{CH3OHi}, T_i, and P_{Bi}, for the enclosure background determination.

(5) Allow the enclosure to stand undisturbed without sampling for four hours.

(6) Measure the hydrocarbon and methanol concentration on the same FID. These are the final concentrations, C_{HCf} and C_{CH3OHf}. Also measure final temperature and barometric pressure.

(7) Calculate the mass change of methanol, hydrocarbons, and hydrocarbons plus methanol in the enclosure according to the equations in paragraph (d) of this section. The enclosure background emissions (hydrocarbons plus methanol) shall not be greater than 0.4g for the 4 hours.

(b) *Initial determination of enclosure internal volume.* Prior to its introduction into service the enclosure internal volume shall be determined by the following procedure.

(1) Carefully measure the internal length, width and height of the enclosure, accounting for irregularities (such as braces) and calculate the internal volume.

(2) Perform an enclosure calibration check according to paragraphs (c) (1) through (7) of this section.

(3) If the calculated mass does not agree within ±2 percent of the injected propane mass, then corrective action is required.

(c) *Hydrocarbon and methanol retention check and calibration.* The hydrocarbon and methanol retention check provides a check upon the calculated volume and also measures the leak rate. Prior to its introduction into service and at least monthly thereafter the enclosure leak rate shall be determined as follows:

(1) Zero and span (calibrate if required) the hydrocarbon analyzer.

(2) Purge the enclosure until a stable background hydrocarbon reading is obtained.

(3) Turn on the mixing blower (if not already on).

(4) Seal enclosure and measure background hydrocarbon concentration, background methanol, temperature, and barometric pressure. These are the initial readings C_{HCi}, C_{CH3OHi}, T_i and P_{Bi} for the enclosure calibration.

(5) Inject into the enclosure a known quantity of pure propane (4g is a convenient quantity) and a known quantity of pure methanol (4g is a convenient quantity) in gaseous form; *i.e.*, at a temperature of at least 150–155 °F (65–68 °C). The propane and methanol may be measured by volume flow or by mass measurement. The method used to measure the propane, and the methanol if appropriate, shall have an accuracy and precision of ±0.5 percent of the measured value.

(6) After a minimum of 5 minutes of mixing, analyze the enclosure atmosphere for hydrocarbon and methanol content, also record temperature and pressure. These measurements are the final readings for the enclosure calibration as well as the initial readings for the retention check.

(7) To verify the enclosure calibration, calculate the mass of propane

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[1] NOTE: When methanol as well as hydrocarbons are present in the evaporative enclosure, the HFID hydrocarbon concentration measurement includes the partial response of the HFID to methanol plus the hydrocarbons. Determination of the HFID response to methanol, § 86.1221, prior to its being placed in service is required for the determination of hydrocarbons.

and the mass of methanol using the measurements taken in steps (4) and (6). See paragraph (d) of this section. This quantity must be within ±2 percent of that measured in step 5 above.

(8) Allow the enclosure to remain sealed for a minimum of 4 hours, analyze the enclosure atmosphere for hydrocarbon and methanol content; record temperature and barometric pressure. These are the final readings for the hydrocarbon and methanol retention check.

(9) Calculate, using the equations in paragraph (d) of this section and the readings taken in step (8), the hydrocarbon and methanol mass. It may not differ by more than ±4 percent of the value in step (6).

(d) *Calculations.* (1) The calculation of net methanol and hydrocarbon mass change is used to determine enclosure background and leak rate. It is also used to check the enclosure volume measurements. The methanol mass change is calculated from the initial and final methanol samples, temperature and pressure according to the following equation:

$$M_{CH3OH} = \left(\frac{V \times C_{MR}}{A_{MR}}\right) \times \left[\left(\frac{T_{Ef}}{V_{Ef} \times T_{SHEDf}}\right)[(A_{MS1f} \times AV_{1f}) + (A_{MS2f} \times AV_{2f})] - \left(\frac{T_{Ei}}{V_{Ei} \times T_{SHEDi}}\right)[(A_{MS1i} \times AV_{1i}) + (A_{MS2i} \times AV_{2i})]\right]$$

Where:

(i) M_{CH3OH}=Methanol mass change, μg.

(ii) V=Enclosure volume, ft^3, as measured in paragraph (b)(1) of this section.

(iii) C_{MR}=Concentration of methanol in standard sample for calibration of GC, μg/ml.

(iv) A_{MR}=GC peak area of standard sample.

(v) T_E=Temperature of sample withdrawn, °R.

(vi) V_E=Volume of sample withdrawn, ft^3.

(vii) P_B=Barometric pressure at time of sampling, in. Hg.

(viii) A_{MS}=GC peak area of test sample.

(ix) AV=Volume of absorbing reagent in impinger.

(x) i=Initial sample.

(xi) f=Final sample.

(xii) 1= First impinger.

(xiii) 2=Second impinger.

(2) The hydrocarbon mass change is calculated from the initial and final FID readings of hydrocarbon concentration, methanol concentration with FID response to methanol, temperature, and pressure according to the following equation:

$$M_{HC} = kV \times 10^{-4} \frac{(C_{HCf} - rC_{CH3OHf}) \times P_{Bf}}{T_f} - \frac{(C_{HCi} - rC_{CH3OHi}) \times P_{Bi}}{T_i}$$

Where:

(i) M_{HC}=Hydrocarbon mass change, g.

(ii) C_{HC}=FID hydrocarbon concentration as ppm carbon including FID response to methanol in the sample.

(iii) C_{CH3OH}=Methanol concentration as ppm carbon

$$= \frac{1.501\times10^{-3}C_{MR}\times T_E}{A_{MR}\times P_B\times V_E} [(A_{S1}\times AV_1)+(A_{S2}\times AV_2)]$$

(iv) V=Enclosure volume, ft^3 (m^3), as measured in paragraph (b)(1) of this section.

(v) r=FID response factor to methanol.

(vi) P_B=Barometric pressure, in. Hg (kPa).

(vii) T=Enclosure ambient temperature, °R(°K).

(viii) i=Indicates initial reading.

(ix) f=Indicates final reading.

(x) (A) k=3.05

(B) *For SI units,* k=17.60

NOTE: Hydrocarbon concentration is stated in ppm carbon, that is, ppm propane × 3. Expressions in parentheses are for SI units.

[54 FR 14564, Apr. 11, 1989]

§ 86.1218-85 Dynamometer calibration.

(a) The dynamometer shall be calibrated at least once each month or performance verified at least once each week and then calibrated as required. The calibration shall consist of the manufacturer's recommended calibration procedure plus a determination of the dynamometer frictional power absorption. If the dynamometer is to be used for driving only the reference (transient) schedule, the frictional power absorption needs to be determined only at 50.0 mph (80.5 km/hr). If the dynamometer is to be used for driving the steady-state cycle, the frictional power absorption needs to be determined through the range of 15 to 50 mph. One method for determining dynamometer frictional power absorption at 50.0 mph (80.5 km/hr) is described below. The same general method can be used at other speeds. Other methods may be used if shown to yield equivalent results. The measured absorbed road power includes the dynamometer friction as well as the power absorbed by the power absorption unit. The dynamometer is driven above the test speed range. The device used to drive the dynamometer is then disengaged from the dynamometer and the roll(s) is (are) allowed to coastdown. The kinetic energy of the system is dissipated by the dynamometer. This method neglects the variations in roll bearing friction due to the drive axle weight of the vehicle. In the case of dynamometers with paired rolls, the inertia and power absorption of the free (rear) roll may be neglected if its inertia is less than 3.0 percent of the total equivalent inertia required for vehicle testing.

(1) Devise a method to determine the speed of the roll(s) to be measured for power absorption. A fifth wheel, revolution pickup, or other suitable means may be used.

(2) Place a vehicle on the dynamometer or devise another method of driving the dynamometer.

(3) If the dynamometer is capable of simulating more than a single inertia mass, engage the inertial flywheel or other inertial simulation system for the most common vehicle mass category for which the dynamometer is used. In addition, other vehicle mass categories may be calibrated, if desired.

(4) Drive the dynamometer up to 50 mph (80.5 km/hr).

(5) Record indicated road power.

(6) Drive the dynamometer up to 60 mph (96.9 km/hr).

(7) Disengage the device used to drive the dynamometer.

(8) Record the time for the dynamometer roll(s) to coastdown from 55.0 mph (88.5 km/hr) to 45.0 mph (72.4 km/hr).

(9) Adjust the power absorption unit to a different level.

(10) Repeat steps (4) to (8) above sufficient times to cover the range of road power used.

(11) Calculate absorbed road power (HP_d). (See paragraph (c) of this section.)

(12) Plot indicated road load power at 50 mph (80.5 km/hr) versus road load power at 50 mph (80.5 km/hr).

(b) The performance check consists of conducting a dynamometer coastdown and comparing the coastdown time to that recorded during the last calibration. If the coastdown times differ by more than 1 second or by 5 percent of the time recorded during the last calibration, whichever is greater, a new calibration is required.

(c) Calculations. The road load power actually absorbed by each roll assembly (or roll-inertia weight assembly) of the dynamometer is calculated from the following equation:

$$HP_d=(\frac{1}{2})(W/32.2)(V_1^2-V_2^2)/550t$$

Where:

HP_d=Power, horsepower (kilowatts)

W=Equivalent inertia, lb (kg)

V_1=Initial velocity, ft/s (m/s) (55 mph=88.5 km/h=80.67 ft/s=24.58 m/s)

V_2=Final velocity, ft/s (m/s) (45 mph=72.4 km/h=66 ft/s=20.11 m/s)

t=Elapsed time for rolls to coast from 55 mph to 45 mph (88.5 to 72.4 km/hr).

(Expressions in parenthesis are for SI units). When the coastdown is from 55 to 45 mph (88.5 to 72.4 km/hr) the above equation reduces to:

$$HP_d=0.06073\ (W/t)$$

For SI units:

$$HP_d=0.09984\ (W/t)$$

The total road load power actually absorbed by the dynamometer is the sum of the absorbed road load power of each roll assembly.

§ 86.1221-85 Hydrocarbon analyzer calibration.

The FID hydrocarbon analyzer shall receive the following initial and periodic calibration.

(a) Initial and periodic optimization of detector response. Prior to its introduction into service and at least annually thereafter the FID hydrocarbon analyzer shall be adjusted for optimum hydrocarbon response. Alternate methods yielding equivalent results to the procedure listed below may be used.

(1) Follow the manufacturer's instructions for instrument startup and basic operating adjustment using the appropriate fuel and zero-grade air.

(2) Optimize on the most common operating range. Introduce into the analyzer, a propane in air mixture with a propane concentration equal to approximately 90 percent of the most common operating range.

(3) Select an operating fuel flow rate that will give near maximum response and least variation in response with minor fuel flow variations.

(4) To determine the optimum air flow, use the fuel flow setting determined above and vary air flow.

(5) After the optimum flow rates have been determined, they are recorded for future reference.

(b) Initial and periodic calibration. Prior to its introduction into service and monthly thereafter the FID hydrocarbon analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate as when analyzing samples.

(1) Adjust analyzer to optimize performance.

(2) Zero the hydrocarbon analyzer with zero-grade air.

(3) Calibrate on each normally used operating range with propane-in-air calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

§ 86.1221-90 Hydrocarbon analyzer calibration.

The FID hydrocarbon analyzer shall receive the following initial and periodic calibrations.

(a) *Initial and periodic optimization of detector response.* Prior to its introduction into service and at least annually thereafter, the FID hydrocarbon analyzer shall be adjusted for optimum hydrocarbon response. (The HFID used with methanol-fueled vehicle shall be operated at 235°±15 °F (113°±8 °C).) Alternate methods yielding equivalent results may be used, if approved in advance by the Administrator.

(1) Follow the manufacturer's instructions or good engineering practice for instrument startup and basic operating adjustment using the appropriate FID fuel and zero-grade air.

(2) Optimize on the most common operating range. Introduce into the analyzer a propane in air mixture with a propane concentration equal to approximately 90 percent of the most common operating range.

(3) Select an operating FID fuel flow rate that will give near maximum response and least variation in response with minor fuel flow variations.

(4) To determine the optimum air flow, use the FID fuel flow setting determined above and vary air flow.

(5) After the optimum flow rates have been determined, record them for future reference.

(b) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter the FID hydrocarbon analyzer shall be calibrated on all normally used instrument ranges, and, if applicable, the methanol response factor shall be determined (paragraph (c) of this section). Use the same flow rate as when analyzing sample.

(1) Adjust analyzer to optimize performance.

(2) Zero the hydrocarbon analyzer with zero-grade air.

(3) Calibrate on each normally used operating range with propane in air calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. For each range calibrated, if the deviation from a least squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

(c) *FID response factor to methanol.* When the FID analyzer is to be used for the analysis of hydrocarbon samples containing methanol, the methanol response factor of the analyzer shall be established. The methanol response factor shall be determined at several concentrations in the range of concentrations in the exhaust sample.

(1) The bag sample of methanol for analysis in the FID shall be prepared using the apparatus shown in Figure M90-1. A known volume of methanol is injected, using a microliter syringe, into the heated mixing zone (250 °F(121 °C)) of the apparatus. The methanol is vaporized and swept into the sample bag with a known volume of zero grade air measured by a dry gas meter.

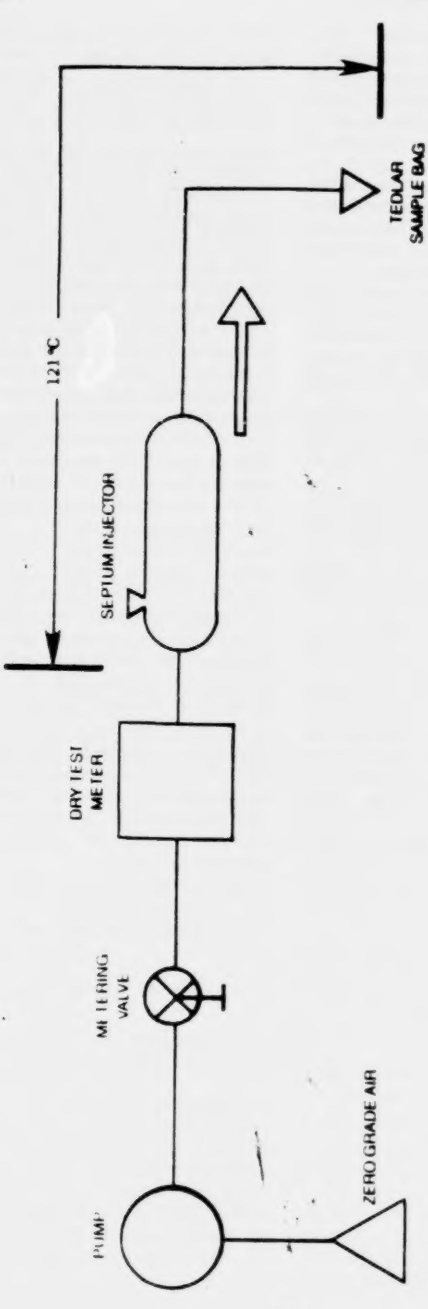

PUMP
ZERO GRADE AIR
METERING VALVE
DRY TEST METER
SEPTUM INJECTOR
121 °C
TEDLAR SAMPLE BAG

FIGURE M90-1 APPARATUS FOR PREPARATION OF FID METHANOL RESPONSE CALIBRATION MIX

(2) The bag sample is analyzed using the FID.

(3) The FID response factor, r, is calculated as follows:

$r = FID_{ppm}/SAM_{ppm}$

Where:

(i) r = FID response factor.

(ii) FID_{ppm} = FID reading in ppmC.

(iii) SAM_{ppm} = methanol concentration in the sample bag in ppmC.

$$= \frac{0.02406 \times \text{Fuel injected} \times \text{Fuel density}}{\text{Air volume} \times \text{Mol. Wt. } CH_3OH}$$

Where:

(iv) 0.02406 = Volume of one mole at 29.92 in Hg and 68°F, m^3.

(v) Fuel injected = Volume of methanol injected, ml.

(vi) Fuel density = Density of methanol, 0.7914 g/ml.

(vii) Air volume = Volume of zero grade air, m^3.

(viii) Mol. Wt. CH_3OH = 32.04.

(d) The gas chromatograph used in the analysis of methanol samples shall be calibrated at least monthly following manufacturers' recommended procedures (certain equipment may require more frequent calibration based on use and good engineering judgment).

[54 FR 14566, Apr. 11, 1989]

§ 86.1226-85 Calibration of other equipment.

Other test equipment used for testing shall be calibrated as often as required by the manufacturer or as necessary according to good practice.

§ 86.1227-85 Test procedures; overview.

(a) The overall test consists of prescribed sequences of fueling, parking, and operating conditions. Vehicles are tested only for evaporative emissions.

(b) The evaporative emission test (gasoline-fueled vehicles only) is designed to determine hydrocarbon evaporative emissions as a consequence of diurnal temperature fluctuation, urban driving and hot soaks during engine-off periods. It is associated with a series of events representative of heavy-duty vehicle operation, which result in hydrocarbon vapor losses. The test procedure is designed to measure:

(1) Diurnal breathing losses resulting from daily temperature changes, measured by the enclosure technique;

(2) Running losses from suspected sources (if indicated by engineering analysis or vehicle inspection) resulting from a simulated trip on a chassis dynamometer, measured by carbon traps; and

(3) Hot soak losses which result when the vehicle is parked and the hot engine is turned off, measured by the enclosure technique.

§ 86.1227-90 Test procedures; overview.

(a) The overall test consists of prescribed sequences of fueling, parking, and operating conditions. Vehicles are tested only for evaporative emissions.

(b) The evaporative emission test (gasoline-fueled and methanol-fueled vehicles) is designed to determine hydrocarbon and/or methanol evaporative emissions as a consequence of diurnal temperature fluctuation, urban driving and hot soaks during engine-off periods. It is associated with a series of events representative of heavy-duty vehicle operation, which result in hydrocarbon and/or methanol vapor losses. The test procedure is designed to measure:

(1) Diurnal breathing losses resulting from daily temperature changes, measured by the enclosure technique;

(2) Running losses from suspected sources (if indicated by engineering analysis or vehicle inspection) resulting from a simulated trip on a chassis dynamometer, measured by carbon traps; and

(3) Hot soak losses which result when the vehicle is parked and the hot engine is turned off, measured by the enclosure technique.

[54 FR 14568, Apr. 11, 1989]

§ 86.1228-85 Transmissions.

(a) All test conditions, except as noted, shall be run in a manner representative of in-use operation, and where appropriate, according to the manufacturer's recommendation to the ultimate purchaser.

(b) Except for the first idle mode, idle modes less than one minute in length shall be run with automatic transmissions in "Drive" and the wheels braked; manual transmissions shall be in gear with the clutch disengaged, except first idle. The first idle mode and idle modes longer than one minute in length shall be run with automatic transmissions in "Neutral," and manual transmissions shall be in "Neutral" with the clutch engaged (clutch may be disengaged for engine start-up).

(c) The vehicle shall be driven with minimum accelerator pedal movement to maintain the desired operation.

(d) Accelerations shall be driven smoothly according to the manufacturer's recommendation to the ultimate purchaser. For manual transmissions, the operator shall accomplish each shift with minimum time. If the vehicle cannot accelerate at the specified rate, the vehicle shall be operated at maximum available power until the vehicle speed reaches the value prescribed for that time in the driving schedule.

(e) For those deceleration modes which decelerate to zero, manual transmission clutches shall be depressed when the speed drops below 15 mph (24.1 km/hr), when engine roughness is evident, or when engine stalling is imminent.

§ 86.1229-85 Dynamometer load determination.

(a) Flywheels, electrical or other means of simulating inertia shall be used. The value of equivalent inertia weight shall be within 250 pounds of the loaded vehicle weight (LVW). Loaded vehicle weight is defined as follows:

(1) For test vehicles which have an actual weight less than 0.5×(GVWR),

LVW = 0.5×(Gross Vehicle Weight Rating)

(2) For test vehicles which have an actual weight (As tested) greater than 0.5×(GVWR),

LVW = Actual Weight of Test Vehicle.

(b) *Power absorption unit adjustment.* (1) The power absorption unit shall be adjusted to reproduce road load power at 50 mph true speed. The indicated road load power setting shall take into account the dynamometer friction. The relationship between road load (absorbed) power and indicated road load power for a particular dynamometer shall be determined by the procedure outlined in § 86.1218-85 or other suitable means.

(2) The road load power used shall be determined from the following equation:

$$RLP = 0.67(H - 0.75)W + 0.00125[LVW - (N \times DW)]$$

Where:

RLP = Road Load Power at 50 mph (horsepower).

H = Vehicle overall maximum height (feet).

W = Vehicle overall maximum width (feet).

LVW = Loaded vehicle weight (pounds).

DW = Vehicle weight supported by the dynamometer (pounds).

N = Number of dynamometer rolls supporting a tire.

or the manufacturer may determine the road load power by an alternate procedure (including coastdown). Such alternate procedures shall exhibit good engineering judgement and shall be subject to review upon request by the Administrator. For vehicles which the manufacturer chooses to certify by the optional light-duty truck certification provision (§ 86.082-1(b)), the evaporative emission test procedure (and standard) will be that specified by the light-duty truck regulations.

[48 FR 1456, Jan. 12, 1983, as amended at 48 FR 52210, Nov. 16, 1983]

§ 86.1230-85 Test sequence; general requirements.

The test sequence shown in Figure M85-1 show the steps encountered as the test vehicle undergoes the test procedure. Ambient temperature levels encountered by the test vehicle throughout the test sequence shall not be less than 68°F (20°C) nor more than 86°F (30°C). The vehicle shall be approximately level during all phases of the test sequence to prevent abnormal fuel distribution.

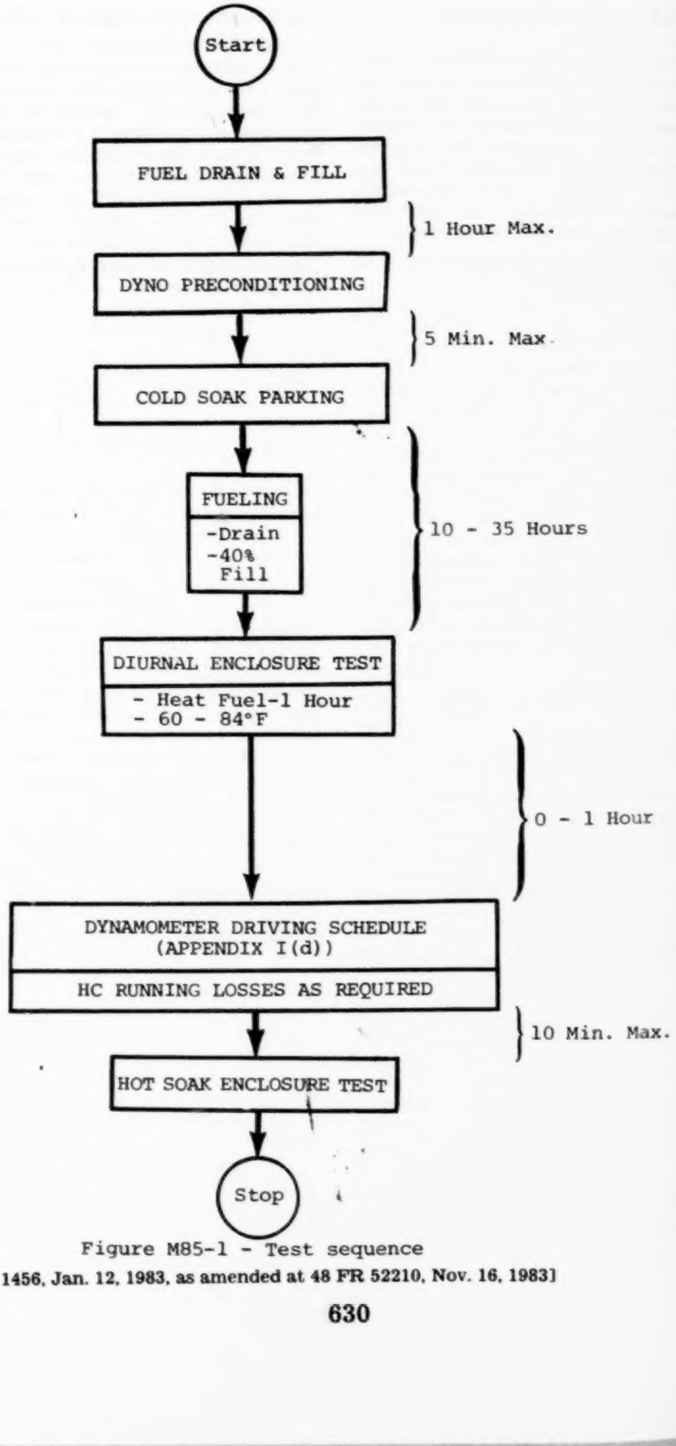

Start
FUEL DRAIN & FILL
1 Hour Max.
DYNO PRECONDITIONING
5 Min. Max.
COLD SOAK PARKING
FUELING
-Drain
-40% Fill
10 - 35 Hours
DIURNAL ENCLOSURE TEST
- Heat Fuel-1 Hour
- 60 - 84°F
0 - 1 Hour
DYNAMOMETER DRIVING SCHEDULE (APPENDIX I(d))
HC RUNNING LOSSES AS REQUIRED
10 Min. Max.
HOT SOAK ENCLOSURE TEST
Stop

Figure M85-1 - Test sequence

[48 FR 1456, Jan. 12, 1983, as amended at 48 FR 52210, Nov. 16, 1983]

§ 86.1231-85 Vehicle preparation.

(a) Prepare the fuel tank(s) for recording the temperature of the prescribed test fuel at the approximate mid-volume of the fuel when the tank is 40% full.

(b) Provide additional fittings and adapters, as required, to accommodate a fuel drain at the lowest point possible in the tank(s) as installed on the vehicle.

(c)(1) Any vapor storage device which adsorbs HC vapors and subsequently releases them to the engine induction system during vehicle operation shall be subjected to a minimum of 30 load-purge cycles or the equivalent thereof (4,000 miles or more of actual in-use vehicle service accumulation shall be considered equivalent). One load-purge cycle shall be accomplished by conducting one of the following procedures:

(i) *Vehicle procedure.* Park a fully-warm vehicle (a vehicle that has been driven for at least 15 minutes) for a time period of at least 3 hours. Fill the fuel tank(s) to the prescribed "tank fuel volume" with specified test fuel (§ 86.1213-85) at room temperature. Then drive the vehicle through at least one cycle of the HDV reference (transient) urban dynamometer driving schedule.

(ii) *Laboratory procedure.* Flow gasoline vapors into a pre-purged vapor storage device until at least 10 percent of the input HC mass flow rate is passing through the device. Purge the device with a volume of air which is at least as great as, and which has a temperature no higher than that which would be drawn through the device if it were installed on the test vehicle and the vehicle was operated according to the HDV reference (transient) urban dynamometer driving schedule. The vapor flow rate, the method used to generate the vapors, the air flow rate, and the air temperature shall be recorded. If pre-blended gas is used, then the composition and characteristics of the gas shall be recorded.

(2) Ten load-purge cycles accumulated immediately prior to testing shall be conducted according to the method in paragraph (c)(1)(i) of this section. The preceding 20 cycles (minimum) shall be conducted according to either of the methods in paragraph (c)(1)(i) or (ii) of this section.

§ 86.1231-90 Vehicle preparation.

(a) Prepare the fuel tank(s) for recording the temperature of the prescribed test fuel at the approximate mid-volume of the fuel when the tank is 40 percent full.

(b) Provide additional fittings and adapters, as required, to accommodate a fuel drain at the lowest point possible in the tank(s) as installed on the vehicle.

(c)(1) Any vapor storage device which absorbs HC vapors and/or CH_3OH vapors and subsequently releases them to the engine induction system during vehicle operation shall be subjected to a minimum of 30 load-purge cycles or the equivalent thereof (4,000 miles or more of actual in-use vehicle service accumulation shall be considered equivalent). One load-purge cycle shall be accomplished by conducting one of the following procedures:

(i) *Vehicle Procedure.* Park a fully-warm vehicle (a vehicle that has been driven for at least 15 minutes) for a time period of at least 3 hours. Fill the fuel tank(s) to the prescribed "tank fuel volume" with specified test fuel (§ 86.1213) at room temperature. Then drive the vehicle through at least one cycle of the HDV reference (transient) urban dynamometer driving schedule.

(ii) *Laboratory Procedure.* Flow vapors (gasoline or methanol, as appropriate) into a pre-purged vapor storage device until at least 10 percent of the input HC or CH_3OH mass flow rate is passing through the device. Purge the device with a volume of air which is at least as great as, and which has a temperature no higher than that which would be drawn through the device if it were installed on the test vehicle and the vehicle was operated according to the HDV reference (transient) urban dynamometer driving schedule. The vapor flow rate, the method used to generate the vapors, the air flow rate, and the air temperature shall be recorded. If pre-blended gas is used, then the composition and characteristics of the gas shall be recorded.

(2) Ten load-purge cycles accumulated immediately prior to testing shall be conducted according to the method in paragraph (c)(1)(i) of this section. The preceding 20 cycles (minimum) shall be conducted according to either of the methods in paragraph (c)(1) (i) or (ii) of this section.

[54 FR 14568, Apr. 11, 1989]

§ 86.1232-85 Vehicle preconditioning.

(a) The vehicle shall be moved to the test area and the following operations performed:

(1) The fuel tank(s) shall be drained through the provided fuel tank(s) drain(s) and filled to the prescribed "tank fuel volume" with the specified test fuel, § 86.1213-85. For the above operations the evaporative emission control system shall neither be abnormally purged nor abnormally loaded.

(2) Within one hour of being fueled the vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through one HDV urban dynamometer driving schedule, (see § 86.1251-85). A test vehicle may not be used to set dynamometer horsepower.

(3) The Administrator may choose to conduct additional preconditioning to insure that the evaporative emissions control system is stabilized. The additional preconditioning shall consist of an intial one hour minimum soak and one, two or three driving cycles of the dynamometer driving schedule, as described in paragraph (a)(2) of this section, each followed by a soak of at least one hour with engine off, engine compartment cover closed and cooling fan off. The vehicle may be driven off the dynamometer for the soak period which follows each driving cycle.

(b) After completion of preconditioning the vehicle shall be driven off the dynamometer and parked. The engine shall be turned off within five minutes of completion of preconditioning. The vehicle may be pushed to its parking location after its engine has been turned off.

§ 86.1232-90 Vehicle preconditioning.

(a) The vehicle shall be moved to the test area and the following operations performed:

(1) The fuel tank(s) shall be drained through the provided fuel tank(s) drain(s) and filled to the prescribed "tank fuel volume" with the specified test fuel, § 86.1213. For the above operations the evaporative emission control system shall neither be abnormally purged nor abnormally loaded.

(2) Within one hour of being fueled the vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through one HDV urban dynamometer driving schedule (*see* § 86.1215). A test vehicle may not be used to set dynamometer horsepower.

(3) The Administrator may choose to conduct additional preconditioning to insure that the evaporative emissions control system is stabilized. The additional preconditioning shall consist of an initial one hour minimum soak and one, two or three driving cycles of the dynamometer driving schedule, as described in paragraph (a)(2) of this section, each followed by a soak of at least one hour with engine off, engine compartment cover closed and cooling fan off. The vehicle may be driven off the dynamometer for the soak period which follows each driving cycle.

(b) After completion of preconditioning the vehicle shall be driven off the dynamometer and parked. The engine shall be turned off within five minutes of completion of preconditioning. The vehicle may be pushed to its parking location after its engine has been turned off.

[54 FR 14568, Apr. 11, 1989]

§ 86.1233-85 Diurnal breathing loss test.

(a) Following vehicle preparatio and vehicle preconditioning procedures described in §§ 86.1231-85 and 86.1232-85 the diurnal test shall start not less than 10 or more than 35 hours after the end of the preconditioning procedure. The start of vehicle operation shall follow the end of the diurnal test within one hour.

(b) The evaporative emissions enclosure shall be purged for several minutes immediately prior to the test.

NOTE: If at any time the hydrocarbon concentration exceeds 15,000 ppm C the enclosure should be immediately purged. Th concentration provides a 4:1 safety factor against the lean flammability limit.

(c) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(d) If not already on, the evaporative enclosure mixing fan(s) shall be turned on at this time.

(e) For vehicles with multiple tanks, the largest tank shall be designated as the primary tank and shall be heated in accordance with the procedures described in paragraph (l) of this section. All other tanks shall be designated as auxiliary tanks and shall undergo a similar heat build such that the fuel temperature shall be within 3°F (1.6°C) of the primary tank.

(f) Immediately prior to the diurnal breathing loss test, the fuel tank(s) of the prepared vehicle shall be drained and recharged with the specified test fuel as defined in § 86.1213-85 to the prescribed "tank fuel volume", as defined in § 86.078-2. The temperature of the fuel prior to its delivery to the fuel tank shall be between 45 and 60°F (7.2 and 16°C). The fuel tank cap(s) is not installed until the diurnal heat build begins.

(g) The test vehicle, with the engine shut off, shall be moved into the evaporative emission enclosure, the test vehicle windows and any storage compartments shall be opened, the fuel tank temperature sensor shall be connected to the temperature recording system, and, if required, the heat source shall be properly positioned with respect to the fuel tank(s) and/or connected to the temperature controller.

(h) The temperature recording system shall be started.

(i) The fuel may be artificially heated to the starting diurnal temperature, 60±2°F (16±1.1°C).

(j) When the fuel temperature recording system reaches at least 58°F (14°C), immediately:

(1) Install fuel tank cap(s).

(2) Turn off purge blowers, if not already off at this time.

(3) Close and seal enclosure doors.

(k) When the fuel temperature recording system reaches 60±2°F (16±1.1°C) immediately:

(1) Analyze enclosure atmosphere for hydrocarbons and record. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCi} (see § 86.1243-85).

(2) Record barometric pressure reading. This is the initial (time=0 minutes) barometric pressure, P_{bi} (see § 86.1243-85).

(3) Record enclosure ambient temperature. This is the initial (time=0 minutes) enclosure ambient temperature, T_i (see § 86.1243-85).

(4) Start diurnal heat build and record time. This commences the 60±2 minute test period.

(l) The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±3°F (±1.6°C):

$F=T_o+0.4t$

for SI units, $C=T_o+(2/9)t$

Where:

F=fuel temperature, F°

C=fuel temperature, F°

t=fuel temperature, F°

T_o=initial temperature in °F (or in °C for SI units).

After 60±2 minutes of heating, the fuel temperature rise shall be 24±°F (13.3±0.5°C).

(m) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the diurnal test.

(n)(1) The end of the diurnal breathing loss test occurs 60±2 minutes after the heat build begins (paragraph (k)(4)). Analyze the enclosure atmosphere for hydrocarbon and record. This is the final (time=60 minutes) hydrocarbon concentration, C_{HCf} (see § 86.1234-85). The time (or elapsed time) of this analysis shall be recorded.

(2) Record barometric pressure reading. This is the final (time=60 minutes) barometric pressure, P_{bf} (see § 86.1234-85).

(3) Record enclosure ambient temperature. This is the final (time=60 minutes) enclosure ambient temperature, T_f (see § 86.1234-85).

(o) The heat source shall be turned off and the enclosure doors unsealed.

(p) The heat source shall be moved away from the vehicle, if required, and/or disconnected from the temperature controller, the fuel tank temperature sensor shall be disconnected from the temperature recording system, and the test vehicle windows and any storage compartments may be closed. The vehicle shall be either driven or pushed out of the evaporative emission enclosure.

[48 FR 1456, Jan. 12, 1983, as amended at 48 FR 52210, Nov. 16, 1983]

§ 86.1233-90 Diurnal breathing loss test.

(a) Following vehicle preparation and vehicle preconditioning procedures described in §§ 86.1231 and 86.1232, the diurnal test shall start not less than 10 or more than 35 hours after the end of the preconditioning procedure. The start of vehicle operation shall follow the end of the diurnal test within one hour.

(b) The evaporative emissions enclosure shall be purged for several minutes immediately prior to the test.

NOTE: If at any time the concentration of hydrocarbons, or of methanol, or of hydrocarbons and methanol exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides a 4:1 safety factor against the lean flammability limit.

(c) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(d) Impingers charged with known volumes of pure deionized water shall be placed in the methanol sampling system (methanol-fueled vehicles only).

(e) If not already on, the evaporative enclosure mixing fan(s) shall be turned on at this time.

(f) For vehicles with multiple tanks, the largest tank shall be designated as the primary tank and shall be heated in accordance with the procedures described in paragraph (m) of this section. All other tanks shall be designated as auxiliary tanks and shall undergo a similar heat build such that the fuel temperature shall be within 3 °F (1.6 °C) of the primary tank.

(g) Immediately prior to the diurnal breathing loss test, the fuel tank(s) of the prepared vehicle shall be drained and recharged with the specified test fuel as defined in § 86.1213 to the prescribed "tank fuel volume", as defined in § 86.078-2. The temperature of the fuel prior to its delivery to the fuel tank shall be between 45 °F and 60 °F (7.2 °C and 16 °C). The fuel tank cap(s) is not installed until the diurnal heat build begins.

(h) The test vehicle, with the engine shut off, shall be moved into the evaporative emission enclosure, the test vehicle windows and any storage compartments shall be opened, the fuel tank temperature sensor shall be connected to the temperature recording system, and, if required, the heat source shall be properly positioned with respect to the fuel tank(s) and/or connected to the temperature controller.

(i) The temperature recording system shall be started.

(j) The fuel may be artificially heated to the starting diurnal temperature, 60 °F±2 °F (16 °C±1.1 °C).

(k) When the fuel temperature recording system reaches at least 58 °F (14 °C), immediately:

(1) Install fuel tank cap(s).

(2) Turn off purge blowers, if not already off at this time.

(3) Close and seal enclosure doors.

(l) When the fuel temperature recording system reaches 60 °F±2 °F (16 °C±1.1 °C) immediately:

(1) Analyze enclosure atmosphere for hydrocarbons and record. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HC1} (*see* § 86.1243).

(2) Simultaneously with initiation of the hydrocarbon analysis, initiate collection of the methanol sample by drawing a sample from the enclosure through the sampling system for four minutes. This is the initial methanol measurement from which methanol concentration C_{CH3OH1} and mass are calculated. Remove impingers and replace with freshly charged clean impingers which will be used to collect the final methanol sample.

(3) Record barometric pressure reading. This is the initial (time=0 minutes) barometric pressure, P_{B1} (see § 86.1243).

(4) Record enclosure ambient temperature. This is the initial (time=0 minutes) enclosure ambient temperature, T_1 (*see* § 86.1243).

(5) Start diurnal heat build and record time. This commences the 60±2 minute test period.

(m) The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±3 °F (±1.6 °C):

(1) $F=T_o+0.4t$

(2) *For SI units,* $C=T_o+(2/9)t$

Where:

F=fuel temperature, °F.
C=fuel temperature, °C.
t=heating time, minutes.
T_o=initial temperature in °F (or in °C for SI units).

After 60±2 minutes of heating, the fuel temperature rise shall be 240±1 °F (13.30±0.5 °C).

(n) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the diurnal test.

(o)(1) The end of the diurnal breathing loss test occurs 60±2 minutes after the heat build begins (paragraph (k)(4) of this section). Analyze the enclosure atmosphere for hydrocarbon and record. This is the final (time=60 minutes) hydrocarbon concentration, C_{HCf} (*see* § 86.1234). The time (or elapsed time) of this analysis shall be recorded.

(2) Simultaneously with the start of the hydrocarbon analysis, initiate collection of the methanol sample. Sample for four minutes. This is the final methanol sample.

(3) *Alternate method for methanol sampling.* Since sample times of longer than four minutes may be necessary in order to collect an adequate and representative sample of methanol at the end of a test (when SHED concentrations are usually increasing rapidly), it may be necessary to rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flowing through the impingers should be minimized in order to prevent any losses. This alternative must be adopted if the four minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis.

(4) Record barometric pressure reading. This is the final (time=60 minutes) barometric pressure, P_{bf} (*see* § 86.1243).

(5) Record enclosure ambient temperature. This is the final (time=60 minutes) enclosure ambient temperature, T_f (*see* § 86.1243).

(p) The heat source shall be turned off and the enclosure doors unsealed.

(q) The heat source shall be moved away from the vehicle, if required, and/or disconnected from the temperature controller, the fuel tank temperature sensor shall be disconnected from the temperature recording system, and the test vehicle windows and any storage compartments may be closed. The vehicle shall be either driven or pushed out of the evaporative emission enclosure.

[54 FR 14568, Apr. 11, 1989]

§ 86.1234-85 Running loss test.

If an engineering analysis or vehicle inspection indicates the possibility of evaporative emissions during vehicle operation, evaporative emission running loss measurements shall be made during vehicle operation on the dynamometer in preparation for the hot soak test. Since running loss measurements cannot be made in the enclosure, the equipment described in Subpart B, § 86.177-17 for running loss measurements shall be used to collect these emissions.

(a) The procedure in § 86.1235-85 shall be followed.

(b) Prior to the initiation of the dynamometer hot soak preparation run, the vapor loss measurement system shall be connected to all suspected sources of running loss evaporative emissions.

(c) Operation on the dynamometer prior to the hot soak test shall be conducted according to the procedures of §§ 86.1235-85 through 86.1237-85.

(d) Within one minute after the end of the hot soak preparation run, the vapor loss measurement system shall be disconnected from the vehicle and the inlets and outlets sealed.

(e) Within one hour from the end of the running loss measurement, the vapor collection traps shall be weighed.

§ 86.1235-85 Dynamometer procedure.

(a) The dynamometer run consists of one HDV urban dynamometer driving schedule cycle starting within one hour after completion of the diurnal loss test. This run includes engine startup (with all accessories turned off) and operation over the driving schedule.

(b) During dynamometer operation, one or more cooling fans shall be positioned so as to direct cooling air to the vehicle in an appropriate manner. The engine compartment cover shall be closed. If, however, the manufacturer can show that the engine compartment cover must be open to provide a test representative of field operation, the Administrator will allow the engine cover to be open. In the case of vehicles with front engine compartments, the fan(s) shall be squarely positioned within 12 inches of the vehicle. In the case of vehicles with rear engine compartments (or if special designs make the above impractical), the cooling fan(s) shall be placed in a position to provide sufficient air to maintain vehicle cooling. The fan capacity shall normally not exceed 10,600 (cfm (5.0 m^3/s)). If, however, the manufacturer can show that during field operation the vehicle receives additional cooling, and that such additional cooling is needed to provide a representative test, the fan capacity may be increased or additional fans used.

(c) The vehicle speed as measured from the dynamometer rolls shall be used.

(d) Practice runs over the prescribed driving schedule may be performed at test points, provided emissions are not measured, for the purpose of finding the minimum throttle action to maintain the proper speed-time relationship, or to permit test procedure adjustments.

NOTE: When using two-roll dynamometers a truer speed-time trace may be obtained by minimizing the rocking of the vehicle in the rolls. The rocking of the vehicle changes the tire rolling radius on each roll. This rocking may be minimized by restraining the vehicle horizontally (or nearly so) by using a cable and winch, or chain.

(e) Drive wheel tires shall be inflated to the maximum gauge pressure recommended to the ultimate purchaser. If drive wheel tires have a maximum recommended inflation gauge pressure of less than 45 psi (310 kPa), they may be inflated up to a gauge pressure of 45 psi (310 kPa) in order to prevent tire damage. The drive wheel tire pressure shall be recorded with the test results.

(f) If the dynamometer has not been operated during the 2-hour period immediately preceding the test it shall be warmed up for 15 minutes by operating at 30 mph (48 km/h) using a non-test vehicle or as recommended by the dynamometer manufacturer.

(g) If the dynamometer horsepower must be adjusted manually, the power shall be set within 1 hour prior to dynamometer operation preceding the hot soak test. The test vehicle shall not be used to make the adjustment.

(h) If the dynamometer horsepower is selected by automatic control, the power may be set anytime prior to the beginning of the driving cycle.

(i) Multiple drive axle vehicles will be tested in one axle drive mode of operation. Full time multiple drive axle vehicles will have all but one axle temporarily disengaged by the vehicle manufacturer. Multiple drive axle vehicles which can be manually shifted to a one axle drive mode will be tested in the one axle drive mode of operation, unless this would pose a safety hazard, in which case all but one axle will be temporarily disengaged by the vehicle manufacturer.

§ 86.1236-85 Engine starting and restarting.

(a) *Starting.* (1) The engine shall be started (including choke operation) according to the manufacturers recommended starting procedures in the owner's manual. The initial idle period shall begin when the engine starts.

(2) The operator may use the choke, accelerator pedal, etc., where necessary to keep the engine running.

(3) If the manufacturer's operating instructions in the owner's manual do not specify a warm engine starting procedure, the engine shall be started by depressing the accelerator pedal about half way and cranking the engine until it starts.

(4) If the vehicle does not start after 10 seconds of cranking, cranking shall cease and the reason for failure to start shall be determined. If failure to start is an operational error, the vehicle shall be rescheduled for the run-

ning loss test. If failure to start is caused by a vehicle malfunction, corrective action of less than 30 minutes duration may be taken, and the test continued. When the engine starts, the driving schedule timing sequence shall begin. If failure to start is caused by vehicle malfunction and the vehicle cannot be started, the test shall be voided, the vehicle removed from the dynamometer, and corrective action may be taken. The reasons for the malfunction (if determined) and the corrective action taken shall be recorded.

(b) *Stalling.* (1) If the engine stalls during an idle period, the engine shall be restarted immediately and the driving schedule continued. If the engine cannot be started soon enough to allow the vehicle to follow the next acceleration as prescribed, the driving schedule indicator shall be stopped. When the vehicle restarts, the driving schedule indicator shall be reactivated.

(2) If the engine stalls during some operating mode other than idle, the driving schedule indicator shall be stopped, the vehicle shall then be restarted and accelerated to the speed required at that point in the driving schedule and the driving schedule continued. During acceleration to this point, shifting shall be performed in accordance with § 86.1228-85.

(3) If the vehicle will not restart within one minute, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken, and the vehicle rescheduled for testing. The reason for the malfunction (if determined) and the corrective action taken shall be recorded.

§ 86.1237-85 Dynamometer runs.

(a) The vehicle shall be either driven or pushed onto the dynamometer; however, if driven, the period of engine operation between the end of the diurnal loss test and beginning of the hot soak preparation run shall not exceed 3 minutes, and the vehicle shall be driven at minimum throttle. The dynamometer run shall follow the diurnal heat build by not more than one hour. The vehicle shall be stored prior to dynamometer operation in such a manner that it is not exposed to precipitation (e.g., rain or dew).

(b) The following steps shall be taken for the dynamometer run:

(1) Place drive wheels of vehicle on the dynamometer.

(2) Position the cooling fan(s).

(3) Attach an exhaust tube to the vehicle tailpipe(s).

(4) Start the engine.

(5) Turn on the cooling fan (s).

(6) Operate the vehicle according to the dynamometer driving schedule (§ 86.1215-85).

(7) At the end of the last deceleration, disconnect the exhaust tube from the vehicle tailpipe(s) and drive vehicle from the dynamometer.

§ 86.1238-85 Hot soak test.

The one-hour hot-soak evaporative emission test shall be conducted immediately following one cycle of the dynamometer driving schedule.

(a) Prior to the completion of the dynamometer cycle, the evaporative emission enclosure shall be purged for several minutes.

(b) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(c) If not already on, the evaporative enclosure mixing fan(s) shall be turned on at this time.

(d) Upon completion of the dynamometer run the exhaust tube shall be disconnected from the vehicle tailpipe(s), the cooling fan(s) shall be moved, and the vehicle shall be disconnected from the dynamometer and driven at minimum throttle to the vehicle entrance of the enclosure.

(e) The vehicle's engine must be stopped before any part of the vehicle enters the enclosure. The vehicle may be pushed or coasted into the enclosure.

(f) The test vehicle windows and any storage compartments shall be opened, if not already open.

(g) The temperature recording system shall be started and the time of engine shut off shall be noted on the evaporative emissions hydrocarbon data recording system.

(h) The enclosure doors shall be closed and sealed within four minutes of engine shutdown and within ten minutes after the end of the dynamometer run.

(i) The 60±0.5 minute hot soak begins when the enclosure doors are sealed. The enclosure atmosphere shall be analyzed and recorded. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCi}, for use in calculating evaporative losses, (see § 86.1243-85).

(j) The test vehicle shall be permitted to soak for a period of one hour in the enclosure.

(k) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the test.

(l) At the end of the 60±0.5 minute test period, the enclosure atmosphere shall again be analyzed and the time recorded. This is the final (time=60 minutes) hydrocarbon concentration, C_{HCf}, for use in calculating evaporative losses, (see § 86.1243-85). This operation completes the evaporative emission measurement procedure.

§ 86.1238-90 Hot soak test.

The one-hour hot-soak evaporative emission test shall be conducted immediately following one cycle of the dynamometer driving schedule.

(a) Prior to the completion of the dynamometer cycle, the evaporative emission enclosure shall be purged for several minutes.

(b) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(c) Fresh impingers shall be installed in the methanol sample collection system immediately prior to the start of the test, if applicable.

(d) If not already on, the evaporative enclosure mixing fan(s) shall be turned on at this time.

(e) Upon completion of the dynamometer run the exhaust tube shall be disconnected from the vehicle tailpipe(s), the cooling fan(s) shall be moved, and the vehicle shall be disconnected from the dynamometer and driven at minimum throttle to the vehicle entrance of the enclosure.

(f) The vehicle's engine must be stopped before any part of the vehicle enters the enclosure. The vehicle may be pushed or coasted into the enclosure.

(g) The test vehicle windows and any storage compartments shall be opened, if not already open.

(h) The temperature recording system shall be started and the time of engine shut off shall be noted on the evaporative emissions hydrocarbon data recording system.

(i) The enclosure doors shall be closed and sealed within four minutes of engine shutdown and within ten minutes after the end of the dynamometer run.

(j) The 60±0.5 minute hot soak begins when the enclosure doors are sealed. The enclosure atmosphere shall be analyzed and recorded. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCi}, for use in calculating evaporative losses (see § 86.1243). The "zero" time methanol sample shall be collected starting at the same time as the hydrocarbon analysis is started. Sampling shall continue for four minutes.

(k) The test vehicle shall be permitted to soak for a period of one hour in the enclosure.

(l) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the test.

(m) Fresh impingers shall be installed in the methanol collection system immediately prior to the end of the test, if applicable.

(n) At the end of the 60±0.5 minute test period, the enclosure atmosphere shall again be analyzed (as described in § 86.1238-90(j) and the time recorded. This is the final (time=60 minutes) hydrocarbon concentration, C_{HCf} and the final methanol level for use in calculating evaporative losses (see § 86.1243). This operation completes the evaporative emission measurement procedure.

(o) *Alternate method for methanol sampling.* Since sample times of longer than four minutes may be necessary in order to collect an adequate and representative sample of methanol at the end of a test (when SHED concentrations are usually increasing rapidly), it may be necessary to rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flowing through the impingers should be minimized in order to prevent any losses. This alternative must be adopted if the four minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis.

[54 FR 14569, Apr. 11, 1989]

§ 86.1242-85 Records required.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System or device tested (brief description).

(c) Date and time of day for each part of the test schedule.

(d) Instrument operator.

(e) Driver or operator.

(f) Vehicle: ID number; Manufacturer; Model Year; Engine family; Evaporative emissions family; Basic engine description (including displacement, number of cylinders, and catalyst usage); Engine maximum power rating and rated speed; Fuel system (including number of carburetors, number of carburetor barrels, fuel injection type, fuel tank(s) capacity and location, and number and size (volume and working capacity) of evaporative control canisters, Engine code; Gross vehicle weight rating; Actual curb weight at zero miles; Actual road load at 50 mph; Transmission configuration; Axle ratio; Vehicle line; Odometer reading; Idle rpm; and Drive wheel tire pressure, as applicable.

(g) Indicated road load power absorption at 50 mph (80 km/hr) and dynamometer serial number. As an alternative to recording the dynamometer serial number, a reference to a vehicle test cell number may be used, provided the test cell records show the pertinent information.

(h) All pertinent instrument information such as tuning, gain, serial number, detector number and range. As an alternative, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(i) Recorder charts: Identify zero, span and enclosure gas sample traces.

(j) Test cell barometric pressure and ambient temperature.

NOTE: A central laboratory barometer may be used: *Provided*, That individual test cell barometric pressures are shown to be within ±0.1 percent of the barometric pressure at the central barometer location.

(k) Fuel temperatures as prescribed.

§ 86.1242-90 Records required.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System or device tested (brief description).

(c) Date and time of day for each part of the test schedule.

(d) Instrument operator.

(e) Driver or operator.

(f) Vehicle: ID number; Manufacturer; Model Year; Engine family; Evaporative emissions family; Basic engine description (including displacement, number of cylinders, and catalyst usage); Engine maximum power rating and rated speed; Fuel system (including number of carburetors, number of carburetor barrels, fuel injection type, fuel tank(s) capacity and location, and number and size (volume and working capacity)) of evaporative control canisters, Engine code; Gross vehicle weight rating; Actual curb weight at zero miles; Actual road load at 50 mph; Transmission configuration; Axle ratio; Vehicle line; Odometer reading; Idle rpm; and Drive wheel tire pressure, as applicable.

(g) Indicated road load power absorption at 50 mph (80 km/hr) and dynamometer serial number. As an alternative to recording the dynamometer serial number, a reference to a vehicle test cell number may be used, provided the test cell records show the pertinent information.

(h) All pertinent instrument information such as tuning, gain, serial number, detector number and range. As an alternative, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(i) Recorder charts: Identify zero, span and enclosure gas sample traces.

(j) Test cell barometric pressure and ambient temperature.

NOTE: A central laboratory barometer may be used: *Provided*, That individual test cell barometric pressures are shown to be within

±0.1 percent of the barometric pressure at the central barometer location.

(k) Fuel temperatures as prescribed.

(l) *For methanol-fueled vehicles:* (1) Volume of sample passed through the methanol sampling system and the volume of deionized water in each impinger.

(2) The methanol concentration in the reference sample and the peak area from the GC analysis of the reference sample.

(3) The peak area of the GC analyses of the test samples (methanol).

[54 FR 14570, Apr. 11, 1989]

§ 86.1243-85 Calculations; evaporative emissions.

The calculation of the net hydrocarbon mass change in the enclosure is used to determine the diurnal and hot-soak mass emissions. The mass is calculated from initial and final hydrocarbon concentrations in ppm carbon, initial and final enclosure ambient temperatures, initial and final barometric pressures, and net enclosure volume using the following equation:

$$M_{HC}=kV_n\times 10^{-4}\left[\frac{C_{HCf}P_{Bf}}{T_f}-\frac{C_{HCi}P_{Bi}}{T_i}\right]$$

where:

M_{HC}=Hydrocarbon mass, g.

C_{HC}=Hydrocarbon concentration as ppm carbon.

V_n=Net enclosure volume ft^3 (m^3) as determined by subtracting 100 ft^3 (2.84 m^3) (volume of vehicle with windows and any storage compartments open) from the enclosure volume. A manufacturer may use the measured volume of the vehicle (instead of the nominal 100 ft^3) provided the measured volume is determined and used for all vehicles tested by that manufacturer.

P_B=barometric pressure, in. Hg (kPa).

T=enclosure ambient temperature, R (K).

k=.208 (12+H/C); for SI units, k=1.2 (12+H/C)

where:

H/C=Hydrogen-carbon ratio.

H/C=2.33 for diurnal emissions.

H/C=2.2 for hot soak emissions.

i=Indicates initial reading.

f=Indicates final reading.

The final recorded results shall be computed by summing the individual evaporative emissions results determined for the diurnal breathing loss test, running loss test, and the hot soak test.

§ 86.1243-90 Calculations; evaporative emissions.

(a) The calculation of the net hydrocarbon, methanol and hydrocarbon plus methanol mass change in the enclosure is used to determine the diurnal and hot soak mass emissions. The mass changes are calculated from initial and final hydrocarbon and methanol concentrations in ppm carbon, initial and final enclosure ambient temperatures, initial and final barometric pressures, and net enclosure volume using the following equations:

(1) For methanol:

$$M_{CH_3OH} = \left(\frac{V_n \times C_{MR}}{A_{MR}}\right) \times$$

$$\left[\left(\frac{T_{Ef}}{(V_E \times T_{SHEDf})}\right) \times [(A_{MS1f} \times AV_{1f}) + (A_{MS2f} \times AV_{2f})\right.$$

$$\left(\frac{T_{Ei}}{(V_E \times T_{SHEDi})}\right) \times [(A_{MS1i} \times AV_{1i}) + (A_{MS2i} \times AV_{2i})$$

Where:

(i) M_{CH_3OH}=Methanol mass change, μg.

(ii) V_n=Net enclosure volume, ft³, as determined by subtracting 50 ft³ (1.42 m³) (volume of vehicle with trunk and windows open) from the enclosure volume. A manufacturer may use the measured volume of the vehicle (instead of the nominal 50 ft³) with advance approval by the Administrator: *Provided*, the measured volume is determined and used for all vehicles tested by that manufacturer.

(iii) C_{MR}=Concentration of methanol in standard sample for calibration of GC, μg/ml.

(iv) A_{MR}=GC peak area of standard sample.

(v) T_E=Temperature of sample withdrawn, °R.

(vi) V_E=Volume of sample withdrawn, ft³.

(vii) T_{SHED}=Temperature of SHED, °R.

(viii) P_B=Barometric pressure at time of sampling, in. Hg.

(ix) A_{MS}=GC peak area of sample.

(x) AV=Volume of absorbing reagent in impinger.

(xi) i=Initial sample.

(xii) f=Final sample.

(xiii) 1=First impinger.

(xiv) 2=Second impinger.

(2) For hydrocarbons:

$$M_{HC} = (kV_n \times 10^{-4}) \left[\frac{(C_{HCf} - rC_{CH_3OHf})P_{Bf}}{T_f} - \frac{(C_{HCi} - rC_{CH_3OHi})P_{Bi}}{T_i}\right]$$

Where:

(i) M_{HC}=Hydrocarbon mass change, g.

(ii) C_{HC}=FID hydrocarbon concentration as ppm carbon including FID response to methanol in the sample.

(iii) C_{CH_3OH}=Methanol concentration as ppm carbon.

$$= \left(\frac{1.501 \times 10^{-3} C_{MR} \times T}{A_{MR} \times P_B \times V_E}\right) \times [(A_{S1} \times AV_1) + (A_{S2} \times AV_2)]$$

(iv) V_n=Net enclosure volume ft³ (m³), as determined by subtracting 50 ft³ (1.42 m³) (volume of vehicle with trunk and windows open) from the enclosure volume. A manufacturer may use the measured volume of the vehicle (instead of the nominal 50 ft³) with advance approval by the Administrator: *Provided*, the measured volume is determined and used for all vehicles tested by that manufacturer.

(v) r=FID response factor to methanol.

(vi) P_B=Barometric pressure, in Hg (kPa).

(vii) T=Enclosure temperature, °R(°K).

(viii) i=initial reading.

(ix) f=final reading.

(x) 1=First impinger.

(xi) 2=Second impinger.

(xii)(A) k=0.208 (12+H/C).

(B) *For SI units*, k=1.2 (12+H/C).

Where:

(xiii) H/C=hydrogen carbon ratio.

(A) H/C=2.33 for diurnal emissions.

(B) H/C=2.2 for hot soak emissions.

(3) For total evaporative emissions:

Total Evaporative Emissions=

$$(M_{HC}+\frac{14.3594\times10^{6}}{32.042}M_{CH3OH})+(M_{HC}+\frac{14.2284}{32.042}\times10^{6}M_{CH3OH})g.$$

(b) The final reported results shall be computed by summing the individual evaporative emission results determined for the diurnal breathing-loss test, running-loss test and the hot-soak test.

[54 FR 14570, Apr. 11, 1989]

Subpart N—Emission Regulations for New Otto-Cycle and Diesel Heavy-Duty Engines; Gaseous and Particulate Exhaust Test Procedures

AUTHORITY: Secs. 202, 206, 207, 208, 301(a), Clean Air Act as amended 42 U.S.C. 7521, 7524, 7541, 7542, and 7601.

SOURCE: 48 FR 52210, Nov. 16, 1983, unless otherwise noted.

§ 86.1301-84 Scope; applicability.

This subpart contains gaseous emission test procedures for gasoline- and diesel-fueled heavy-duty engines. It applies to 1984 and later model years.

§ 86.1301-88 Scope; applicability.

This subpart contains gaseous emission test procedures for gasoline-fueled heavy-duty engines and gaseous and particulate emission test procedures for heavy-duty diesel engines. It applies to 1988 and later model years.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10694, Mar. 15, 1985]

§ 86.1301-90 Scope; applicability.

This subpart contains gaseous emission test procedures for Otto-cycle and diesel heavy-duty engines, and particulate emission test procedures for diesel heavy-duty engines. It applies to 1990 and later model years.

[54 FR 14571, Apr. 11, 1989]

§ 86.1302-84 Definitions.

The definitions in § 86.084-2 apply to this subpart.

§ 86.1303-84 Abbreviations.

The abbreviations in § 86.084- apply to this subpart.

§ 86.1304-84 Section numbering; construction.

(a) The model year of initial applicability is indicated by the section number. The two digits following the hyphen designate the first model year for which a section is effective. A section remains effective until superseded.

Example: Section § 86.1311-84 applies to the 1984 and subsequent model years until superseded. If a section § 86.1311-88 is promulgated it would take effect beginning with the 1988 model year; § 86.1311- would apply to model years 1984 through 1987.

(b) A section reference without model year suffix refers to the section applicable for the appropriate model year.

(c) Unless indicated, all provisions in this subpart apply to both gasoline- and diesel-fueled heavy-duty engines.

§ 86.1304-90 Section numbering; construction.

(a) The model year of initial applicability is indicated by the section number. The two digits following the hyphen designate the first model year for which a section is effective. A section remains effective until superseded.

Example: Section § 86.1311-84 applies to the 1984 and subsequent model years until superceded. If a section § 86.1311-88 is promulgated it would take effect beginning with the 1988 model year; § 86.1311-84 would apply to model years 1984 through 1987.

(b) A section reference without a model year suffix refers to the section applicable for the appropriate model year.

(c) Unless indicated, all provisions in this subpart apply to both Otto-cycle and diesel heavy-duty engines.

[54 FR 14571, Apr. 11, 1989]

§ 86.1305-84 Introduction; structure of subpart.

(a) This subpart describes the equipment required and the procedures to follow in order to perform exhaust emission tests on gasoline- and diesel-fueled heavy-duty engines. Subpart A sets forth the testing requirements and test intervals necessary to comply with EPA certification procedures.

(b) Four topics are addressed in this subpart. Sections 86.1306-84 through 86.1315-84 set forth specifications and equipment requirements; §§ 86.1316-84 through 86.1326-84 discuss calibration methods and frequency; test procedures are listed in §§ 86.1327-84 through 86.1341-84; calculation formulae are found in § 86.1342-84; data requirements are found in § 86.1344-84.

§ 86.1305-90 Introduction; structure of subpart.

(a) This subpart describes the equipment required and the procedures to follow in order to perform exhaust emission tests on Otto-cycle and diesel heavy-duty engines. Subpart A sets forth the testing requirements and test intervals necessary to comply with EPA certification procedures.

(b) Four topics are addressed in this subpart. Sections 86.1306 through 86.1315 set forth specifications and equipment requirements; §§ 86.1316 through 86.1326 discuss calibration methods and frequency; test procedures are listed in §§ 86.1327 through 86.1341; calculation formula are found in § 86.1342; and data requirements are found in § 86.1344.

[54 FR 14571, Apr. 11, 1989]

§ 86.1306-84 Equipment required and specifications; overview.

This subpart contains procedures for exhaust emission tests on gasoline- or diesel-fueled heavy-duty engines. Equipment required and specifications are as follows:

(a) *Exhaust emission tests.* All engines subject to this subpart are tested for exhaust emissions. Gasoline- and diesel-fueled engines are tested identically with the exception of hydrocarbon measurements; diesel-fueled engines require a heated hydrocarbon detector, § 86.1310-84. Necessary equipment and specifications appear in §§ 86.1308-84 through 86.1311-84.

(b) *Fuel, analytical gas, and engine cycle specifications.* Fuel specifications for exhaust emission testing are specified in § 86.1313-84. Analytical gases are specified in § 86.1314-84. The heavy-duty test cycles for use in exhaust testing are described in § 86.1333-84 and specified in Appendix I to this part.

§ 86.1306-88 Equipment required and specifications; overview.

(a) *Exhaust emission tests.* All engines subject to this subpart are tested for exhaust emissions. Diesel and gasoline-fueled engines are tested identically with the exception of the systems used to measure hydrocarbon, nitrogen oxide, and particulate; diesel engines require a heated, continuous hydrocarbon detector and a continuous nitrogen oxide detector (§ 86.1310-88); gasoline-fueled engines are not tested for particulate emissions (§ 86.1309-84). Necessary equipment and specifications appear in

§§ 86.1308-84, 86.1309-84, 86.1310-87 and 86.1311-84.

(b) *Fuel, analytical gas, and engine cycle specifications.* Fuel specifications for exhaust emission testing are specified in § 86.1313-84. Analytical gases are specified in § 86.1314-84. The EPA heavy-duty transient engines cycles for use in exhaust testing are described in § 86.1333-84 and specified in Appendix I to this part.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10694, Mar. 15, 1985]

§ 86.1306-90 Equipment required and specifications; overview.

(a) *Exhaust emission tests.* All engines subject to this subpart are tested for exhaust emissions. Petroleum-fueled and methanol-fueled, Otto-cycle and diesel engines are tested identically with the exception of the systems used to measure hydrocarbon, nitrogen oxide, methanol, formaldehyde, and particulate; petroleum-fueled diesel engines require a heated, continuous hydrocarbon detector and a continuous nitrogen oxide detector (§ 86.1310); methanol-fueled engines require a heated hydrocarbon detector, a methanol detector and a formaldehyde detector; gasoline-fueled and methanol-fueled Otto-cycle engines are not tested for particulate emissions (§ 86.1309). Necessary equipment and specifications appear in §§ 86.1308, 86.1309, 86.1310 and 86.1311.

(b) *Fuel, analytical gas, and engine cycle specifications.* Fuel specifications for exhaust emission testing are specified in § 86.1313. Analytical gases are specified in § 86.1314. The EPA heavy-duty transient engines cycles for use in exhaust testing are described in § 86.1333 and specified in Appendix I to this part.

[54 FR 14572, Apr. 11, 1989]

§ 86.1308-84 Dynamometer and engine equipment specifications.

(a) *Engine dynamometer.* The engine dynamometer system must be capable of controlling engine torque and rpm simultaneously over transient cycles. The transient torque and rpm schedules described in § 86.1333-84 and specified in Appendix I ((f)(i), (2) and (3)) must be followed within the accuracy requirements specified in § 86.1341-84. In addition to these general requirements, the engine or dynamometer readout signals for speed and torque shall meet the following accuracy specifications:

(1) Engine speed readout shall be accurate to within ±2 percent of the absolute standard value, as defined in paragraph (d) of this section.

(2) Engine flywheel torque readout shall be accurate to either within ±1 percent of the NBS "true" value torque (as defined in paragraph (e) of this section), or the following accuracies:

(i) ±2.5 ft-lbs. of the NBS "true" value if the full scale value is 550 ft-lbs. or less.

(ii) ±5 ft-lbs. of the NBS "true" value if the full scale value is 1050 ft-lbs. or less.

(iii) ±10 ft.-lbs., of the NBS "true" value if the full scale value is greater than 1050 ft.-lbs.

(3) *Option:* Internal dynamometer signals (i.e., armature current, etc.) may be used for torque measurement provided that it can be shown that the engine flywheel torque during the test cycle conforms to the accuracy specifications in paragraph (a) of this section. Such a measurement system must include compensation for increased or decreased flywheel torque due to the armature inertia during accelerations and decelerations in the test cycle.

(b) *Cycle verification equipment.* In order to verify that the test engine has followed the test cycle correctly the dynamometer or engine readout signals for speed and torque must be collected in a manner that allows a statistical correlation between the actual engine performance and the test cycle (See § 86.1341-84). Normally this collection process would involve conversion of analog dynamometer or engine signals into digital values for storage in a computer. The conversion of dynamometer or engine values (computer or other) that are used to evaluate the validity of engine performance in relation to the test cycle shall be performed in a manner such that:

(1) Speed values used for cycle evaluation are accurate to within 2 percent of the dynamometer or engine flywheel torque readout value.

(2) Engine flywheel torque values used for cycle evaluation are accurate to within 2 percent of the dynamometer or engine flywheel torque readout value.

(c) *Option:* For some systems it may be more convenient to combine the tolerances in paragraphs (a) and (b) of this section. This is permitted if the root mean square method (RMS) is used. The RMS values would then refer to accuracy in relationship to absolute standard or to NBS "true" values.

(1) Speed values used for cycle evaluation shall be accurate to within ±2.8 percent of the absolute standard values, as defined in paragraph (d) of this section.

(2) Engine flywheel torque values used for cycle evaluation shall be accurate to within ±3.6 percent of NBS "true" values, as determined in paragraph (e) of this section.

(d) *Speed calibration equipment.* A 60-tooth (or greater) wheel in combination with a common mode rejection frequency counter is considered an absolute standard for engine or dynamometer speed.

(e) *Torque calibration equipment.* Two techniques are allowed for torque calibration. Alternate techniques may be used if shown to yield equivalent accuracies. The NBS "true" value torque is defined as the torque calculated by taking the product of an NBS traceable weight or force and a sufficiently accurate horizontal lever arm distance, corrected for the hanging torque of the lever arm.

(1) The lever-arm dead-weight technique involves the placement of known weights at a known horizontal distance from the center of rotation of the torque measuring device. The equipment required is:

(i) *Calibration weights.* A minimum of six calibration weights for each range of torque measuring device used are required. The weights must be approximately equally spaced and each must be traceable to NBS weights. Laboratories located in foreign countries may certify calibration weights to local government bureau standards. Certification of weight by state government Bureau of Weights and Measures is acceptable. Effects of changes in gravitational constant at the test site may be accounted for if desired.

(ii) *Lever arm.* A lever arm with a minimum length of 24 inches is required. The horizontal distance from the centerline of the engine torque measurement device to the point of weight application shall be accurate to within ±0.10 inches. The arm must be balanced, or the hanging torque of the arm must be known to within ±0.1 ft-lbs.

(2) The transfer technique involves the calibration of a master load cell (i.e., dynamometer case load cell). This calibration can be done with known calibration weights at known horizontal distances, or by using a hydraulically actuated precalibrated master load cell. This calibration is then transferred to the flywheel torque measuring device. The technique involves the following steps:

(i) A master load cell shall be either precalibrated or be calibrated per paragraph (e)(1)(i) of this section with known weights traceable to NBS, and used with the lever arm(s) specified in paragraph (e)(2)(ii) of this section. The dynamometer should be either running or vibrated during this calibration to minimize static hysteresis.

(ii) A lever arm(s) with a minimum length of 24 inches is (are) required. The horizontal distances from the centerline of the master load cell, to the centerline of the dynamometer, and to the point of weight or force application shall be accurate to within ±0.10 inches. The arm(s) must be balanced or the net hanging torque of the arm(s) must be known to within ±0.1 ft.-lbs.

(iii) Transfer of calibration from the case or master load cell to the flywheel torque measuring device shall be performed with the dynamometer operating at a constant speed. The flywheel torque measurement device readout shall be calibrated to the master load cell torque readout at a minimum of six loads approximately equally spaced across the full useful ranges of both measurement devices. (Note that good engineering practice requires that both devices have approximately equal useful ranges of torque measurement.) The transfer calibration shall be performed in a manner such that the accuracy requirements of paragraph (a)(2) of this section for the flywheel torque measurement device readout be met or exceeded.

(2) Other techniques may be used if shown to yield equivalent accuracy.

(f) *Diesel engines only.* If direct measurement of mass fuel consumption is chosen as an option in lieu of dilute exhaust CO_2 measurement, the fuel measurement device shall be accurate to within ±2 percent of actual mass fuel flow.

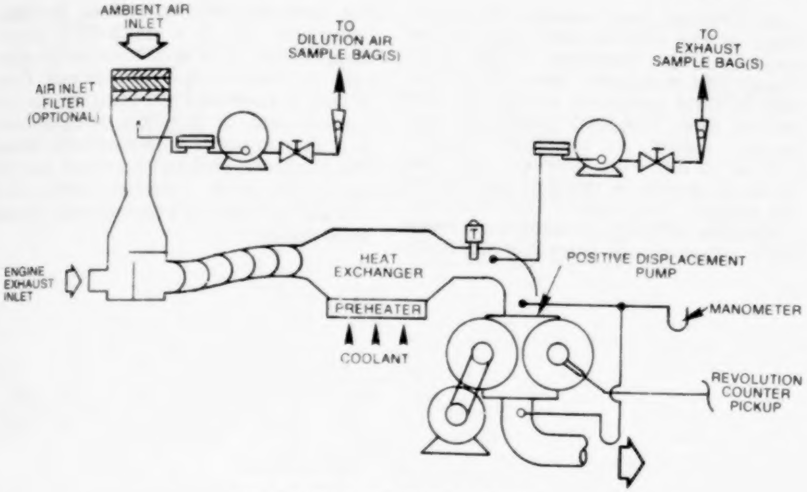
(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48142, Dec. 10, 1984; 52 FR 47870, Dec. 16, 1987]

§ 86.1309–84 Exhaust gas sampling system; gasoline-fueled engines.

(a)(1) *General.* The exhaust gas sampling system is designed to measure the true mass emissions of engine exhaust. In the CVS concept of measuring mass emissions, two conditions must be satisfied: The total volume of the mixture of exhaust and dilution air must be measured, and a continuously proportioned sample of volume must be collected for analysis. Mass emissions are determined from the sample concentration and total flow over the test period.

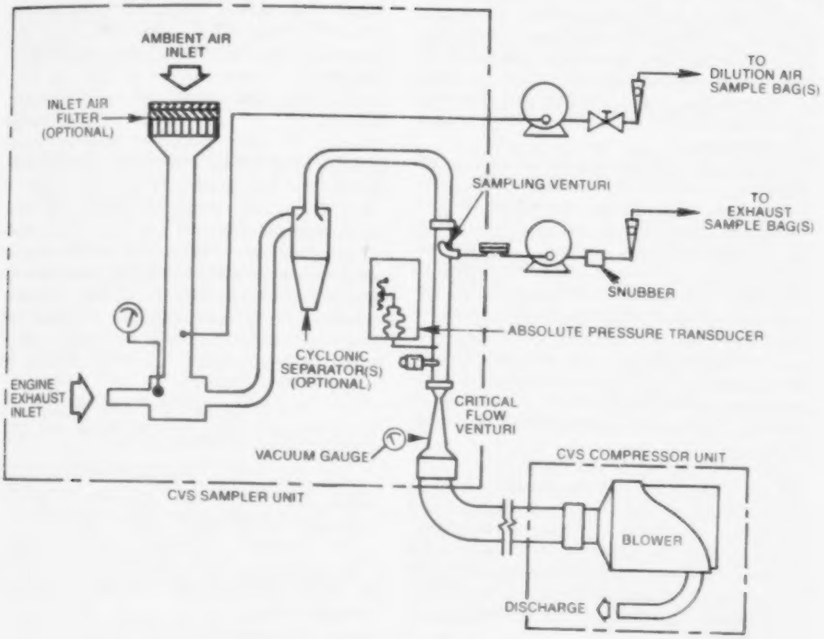
(2) *Positive displacement pump.* The positive displacement pump-constant volume sampler (PDP-CVS), Figure N84-1, meters total dilute exhaust flow at a constant temperature and pressure through the pump. The total volume is measured by counting the pump revolutions. The proportional sample is achieved by sampling at a constant flow rate.


AMBIENT AIR INLET
AIR INLET FILTER (OPTIONAL)
TO DILUTION AIR SAMPLE BAG(S)
TO EXHAUST SAMPLE BAG(S)
T
ENGINE EXHAUST INLET
HEAT EXCHANGER
PREHEATER
COOLANT
POSITIVE DISPLACEMENT PUMP
MANOMETER
REVOLUTION COUNTER PICKUP

(SEE FIG N84-5 FOR SYMBOL LEGEND)

FIGURE N84-1 — EXHAUST GAS SAMPLING SYSTEM PDP-CVS
FOR GASOLINE FUELED ENGINES

(3) *Critical flow venturi.* The operation of the critical flow venturi constant volume sampler (CFV-CVS), Figure N84-2, is based upon the principles of fluid dynamics associated with critical flow. The CFV system is commonly called a constant volume system (CVS) even though the flow varies. It would be more proper to call the critical flow venturi (CFV) system a constant proportion sampling system since proportional sampling throughout temperature excursions is maintained by use of a small CFV in the sample line. The variable mixture flow rate is maintained at choked flow, which is inversely proportional to the square root of the gas temperature, and is computed continuously. Since the pressure and temperature are the same at both venturi inlets, the sample volume is proportional to the total volume.


AMBIENT AIR INLET
INLET AIR FILTER (OPTIONAL)
TO DILUTION AIR SAMPLE BAG(S)
SAMPLING VENTURI
TO EXHAUST SAMPLE BAG(S)
SNUBBER
ABSOLUTE PRESSURE TRANSDUCER
CYCLONIC SEPARATOR(S) (OPTIONAL)
ENGINE EXHAUST INLET
CRITICAL FLOW VENTURI
VACUUM GAUGE
CVS COMPRESSOR UNIT
CVS SAMPLER UNIT
BLOWER
DISCHARGE

(SEE FIG. N84-5 FOR SYMBOL LEGEND)

FIGURE N84-2 — EXHAUST GAS SAMPLING SYSTEM (CFV-CVS)
FOR GASOLINE FUELED ENGINES

(4) *Other systems.* Other sampling and/or analytical systems including the systems described in § 86.1310-84 for diesel-fueled engines may be used if shown to yield equivalent results, and if approved in advance by the Administrator.

(5) Since various configurations can produce equivalent results, exact conformance with these drawings is not required. Additional components such as instruments, valves, solenoids, pumps and switches may be used to provide additional information and coordinate the functions of the component systems. Other components such as snubbers, which are not needed to maintain accuracy on some systems, may be excluded if their exclusion is based upon good engineering judgment.

(b) *Component description, PDP-CVS.* The PDP-CVS, Figure N84-1, consists of a dilution air filter and mixing assembly, heat exchanger, positive displacement pump, sampling system, and associated valves, pressure and temperature sensors. The PDP-CVS shall conform to the following requirements:

(1) Exhaust system backpressure must not be artificially lowered by the CVS or dilution air inlet system. Measurements to verify this should be made in the raw exhaust immediately upstream of the inlet to the CVS. (For diesels, this measurement should be made immediately upstream of the backpressure set device.) This verification requires the continuous measurement and comparison of raw exhaust static pressure observed during a transient cycle, both with and without the operating CVS. Static pressure measured with the operating CVS system shall remain within ±5 inches of water (1.2 kPa) of the static pressure measured without connection to the CVS, at identical moments in the test cycle. (Sampling systems capable of maintaining the static pressure to within ±1 inch of water (0.25 kPa) will be used by the Administrator if a written request substantiates the need for this closer tolerance.) This requirement is essentially a design specification for the CVS/dilution air inlet system, and should be performed as often as good engineering practice dictates (e.g., after installation of an uncharacterized CVS, addition of an unknown inlet restriction on the dilution air, etc.).

(2) The gas mixture temperature, measured at a point immediately ahead of the positive displacement pump and after the heat exchanger, shall be maintained within ±10° F (5.6° C) of the average operating temperature observed during the test. (The average operating temperature may be estimated from the average operating temperature from similar tests.) The temperature measuring system (sensors and readout) shall have an accuracy and precision of ±3.4° F (1.9° C).

(3) The pressure gauges shall have an accuracy and precision of ±3 mm Hg (0.4 kPa).

(4) The flow capacity of the CVS shall be large enough to eliminate water condensation in the system.

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow.

(c) *Component description, CFV-CVS.* The CFV-CVS, Figure N84-2 consists of a dilution air filter (optional) and mixing assembly, optional cyclonic particulate separator(s), sampling venturi, critical flow venturi, sampling system, and assorted valves, pressure and temperature sensors. The CFV-CVS shall conform to the following requirements:

(1) Static pressure variations in the raw exhaust shall conform to the specifications detailed in paragraph (b)(1) of this section.

(2) The temperature measuring system (sensors and readout) shall have an accuracy and precision of ±3.4° F (1.9° C). The temperature measuring system used in a CVS without a heat exchanger shall have a response time of 1.50 seconds to 62.5 percent of a temperature change (as measured in hot silicone oil). There is no response time requirement for a CVS equipped with a heat exchanger.

(3) The pressure measuring system (sensors and readout) shall have an accuracy and precision of ±3 mm Hg (0.4 kPa).

(4) The flow capacity of the CVS shall be large enough to prevent water condensation in the system.

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow.

§ 86.1309-90 Exhaust gas sampling system; gasoline-fueled and methanol-fueled Otto-cycle engines.

(a)(1) *General.* The exhaust gas sampling system described in this paragraph is designed to measure the true mass of gaseous emissions in the exhaust of either gasoline-fueled or methanol-fueled Otto-cycle engines. In the CVS concept of measuring mass emissions, two conditions must be satisfied; the total volume of the mixture of exhaust and dilution air must be measured, and a continuously proportioned volume of sample must be collected for analysis. Mass emissions are determined from the sample concentration and total flow over the test period.

(2) *Engine exhaust to CVS duct.* For methanol-fueled engines, cooling of the exhaust gases in the duct connecting the engine exhaust to the dilution tunnel shall be minimized. This may be accomplished by:

(i) Using a duct of unrestricted length maintained at 235°±15 °F (113°±8 °C). (Heating and possibly cooling capabilities as required,) or

(ii) Using a short up to 12 feet long, duct constructed of smooth wall pipe with a minimum of flexible sections, maintained at 235°±15 °F (113°±8 °C) prior to the test and during periods when the engine is not in operation (insulation may remain in place and/or heating may occur during testing provided maximum temperature is not exceeded), or

(iii) Using a smooth wall duct less than five feet long with no required heating, or

(iv) Omitting the duct and performing the exhaust gas dilution function at the engine exhaust manifold or immediately after exhaust aftertreatment systems.

(3) *Positive displacement pump.* The Positive Displacement Pump Constant Volume Sampler (PDP-CVS), Figure N90-1 satisfies the first condition by metering at a constant temperature and pressure through the pump. The total volume is measured by counting the revolutions made by the calibrated positive displacement pump. The proportional samples for the bag sample and for methanol fueled vehicles, the methanol sample (Figure N90-2) and the formaldehyde sample (Figure N90-3), are achieved by sampling at a constant flow rate. For methanol-fueled engines, the sample lines for the methanol and formaldehyde samples are heated to 235°±15 °F (113°±8 °C). Note: For 1990 through 1994 model year methanol-fueled engines, methanol and formaldehyde sampling may be omitted provided the bag sample (hydrocarbons and methanol) is analyzed using a HFID calibrated with methanol.

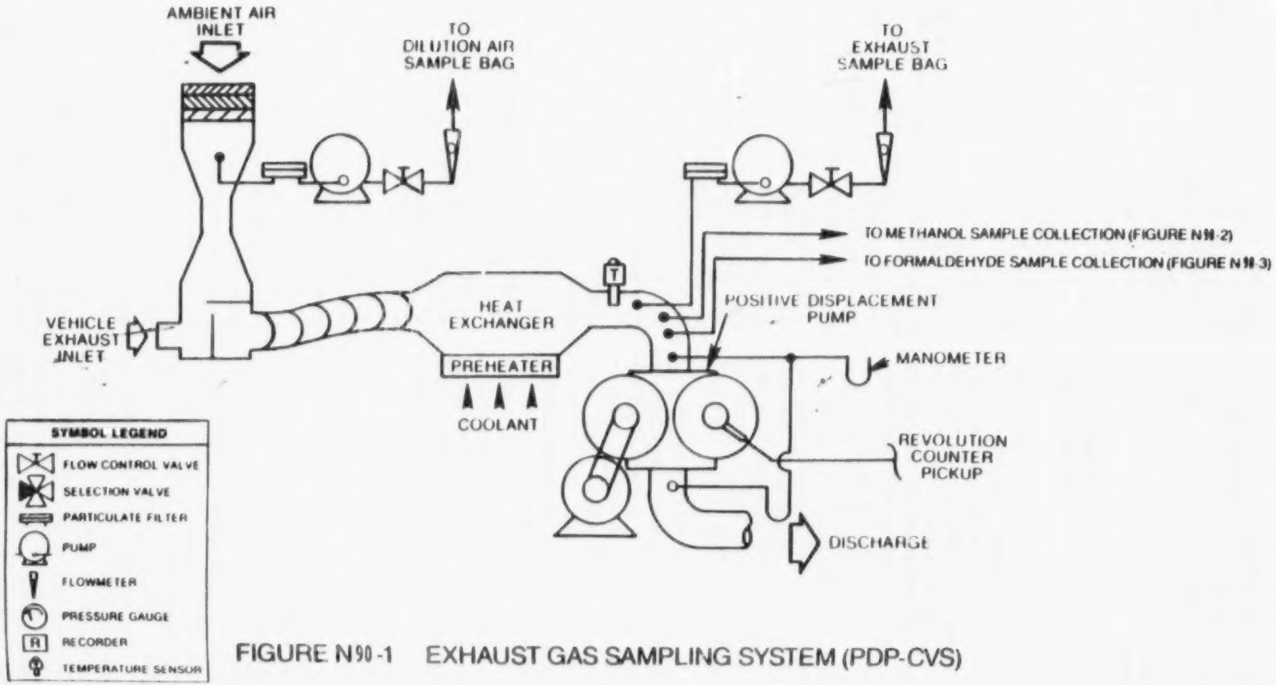

AMBIENT AIR INLET
TO DILUTION AIR SAMPLE BAG
TO EXHAUST SAMPLE BAG
TO METHANOL SAMPLE COLLECTION (FIGURE N90-2)
TO FORMALDEHYDE SAMPLE COLLECTION (FIGURE N90-3)
VEHICLE EXHAUST INLET
HEAT EXCHANGER
PREHEATER
COOLANT
T
POSITIVE DISPLACEMENT PUMP
MANOMETER
REVOLUTION COUNTER PICKUP
DISCHARGE
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
R
RECORDER
TEMPERATURE SENSOR

FIGURE N90-1 EXHAUST GAS SAMPLING SYSTEM (PDP-CVS)

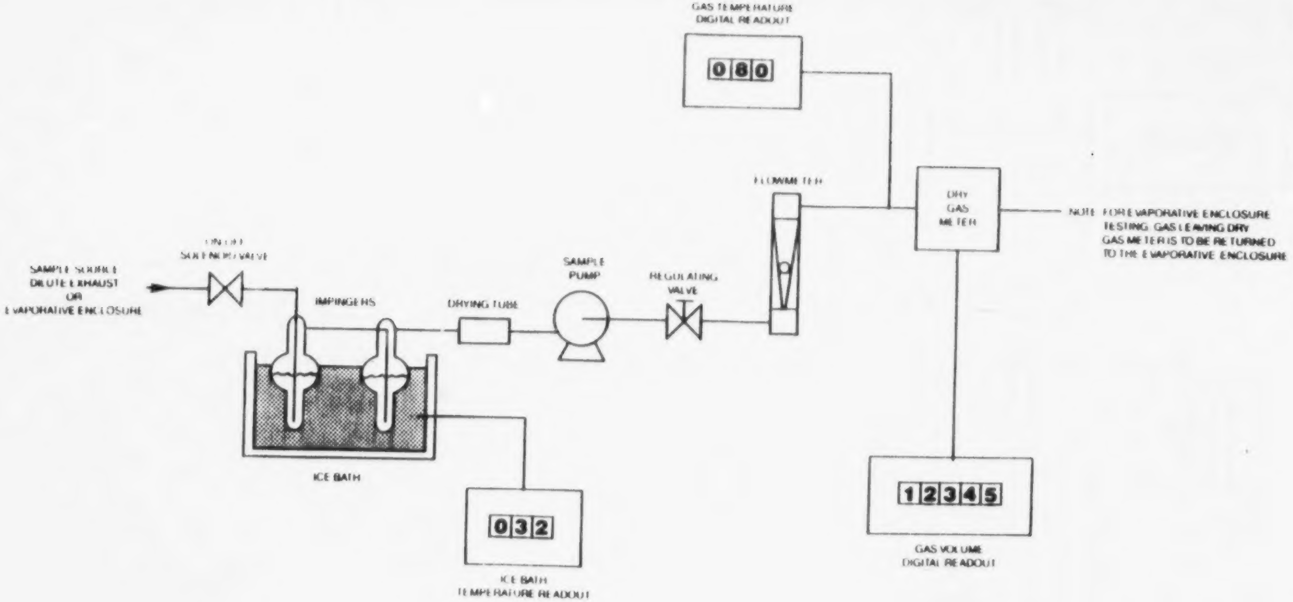

GAS TEMPERATURE DIGITAL READOUT
080
FLOWMETER
DRY GAS METER
NOTE: FOR EVAPORATIVE ENCLOSURE TESTING GAS LEAVING DRY GAS METER IS TO BE RETURNED TO THE EVAPORATIVE ENCLOSURE
SAMPLE SOURCE DILUTE EXHAUST OR EVAPORATIVE ENCLOSURE
ON-OFF SOLENOID VALVE
IMPINGERS
DRYING TUBE
SAMPLE PUMP
REGULATING VALVE
ICE BATH
032
ICE BATH TEMPERATURE READOUT
12345
GAS VOLUME DIGITAL READOUT

FIGURE N90-2 METHANOL SAMPLE COLLECTION FLOW SCHEMATIC

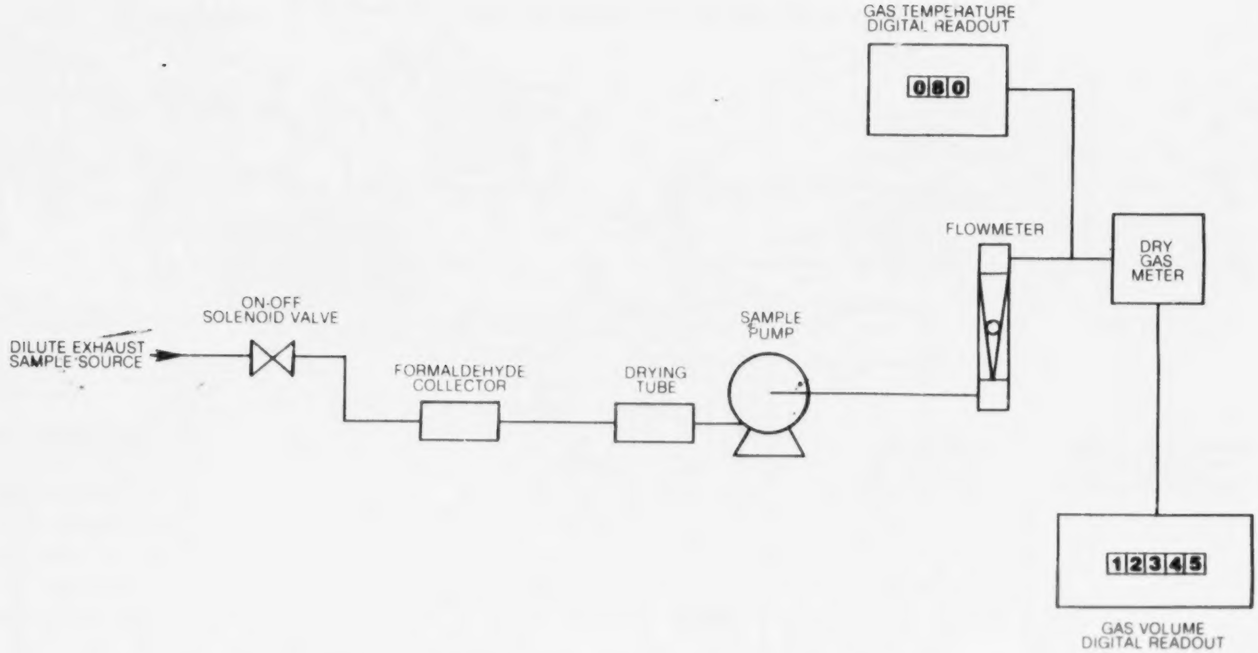

GAS TEMPERATURE DIGITAL READOUT
080
FLOWMETER
DRY GAS METER
ON-OFF SOLENOID VALVE
SAMPLE PUMP
DILUTE EXHAUST SAMPLE SOURCE
FORMALDEHYDE COLLECTOR
DRYING TUBE
12345
GAS VOLUME DIGITAL READOUT

FIGURE N90-3 FORMALDEHYDE SAMPLE COLLECTION FLOW SCHEMATIC

(4) *Critical flow venturi.* The operation of the Critical Flow Venturi Constant Volume Sampler (CFV-CVS), Figure N90-4 is based upon the principles of fluid dynamics associated with critical flow. The CFV system is commonly called a constant volume system (CVS) even though the flow varies. It would be more proper to call the critical flow venturi (CFV) system a constant proportion sampling system since proportional sampling throughout temperature excursions is maintained by use of a small CFVs in the sample lines. For methanol-fueled engines, one line supplies sample for the bag sample, another line supplies sample for the methanol sample, and a third line supplies sample for the formaldehyde sample. The lines for the methanol and formaldehyde samples are heated to 235°±15 °F (113°±8 °C) with care being taken to ensure that the CFVs of the sample probes are not heated.

NOTE: For 1990 through 1994 model year methanol-fueled engines, methanol and formaldehyde sampling may be omitted provided the bag sample (hydrocarbons and methanol) is analyzed using a HFID calibrated with methanol. The variable mixture flow rate is maintained at choked flow, which is inversely proportional to the square root of the gas temperature, and is computed continuously. Since the pressure and temperature are the same at all venturi inlets, the sample volume is proportional to the total volume.

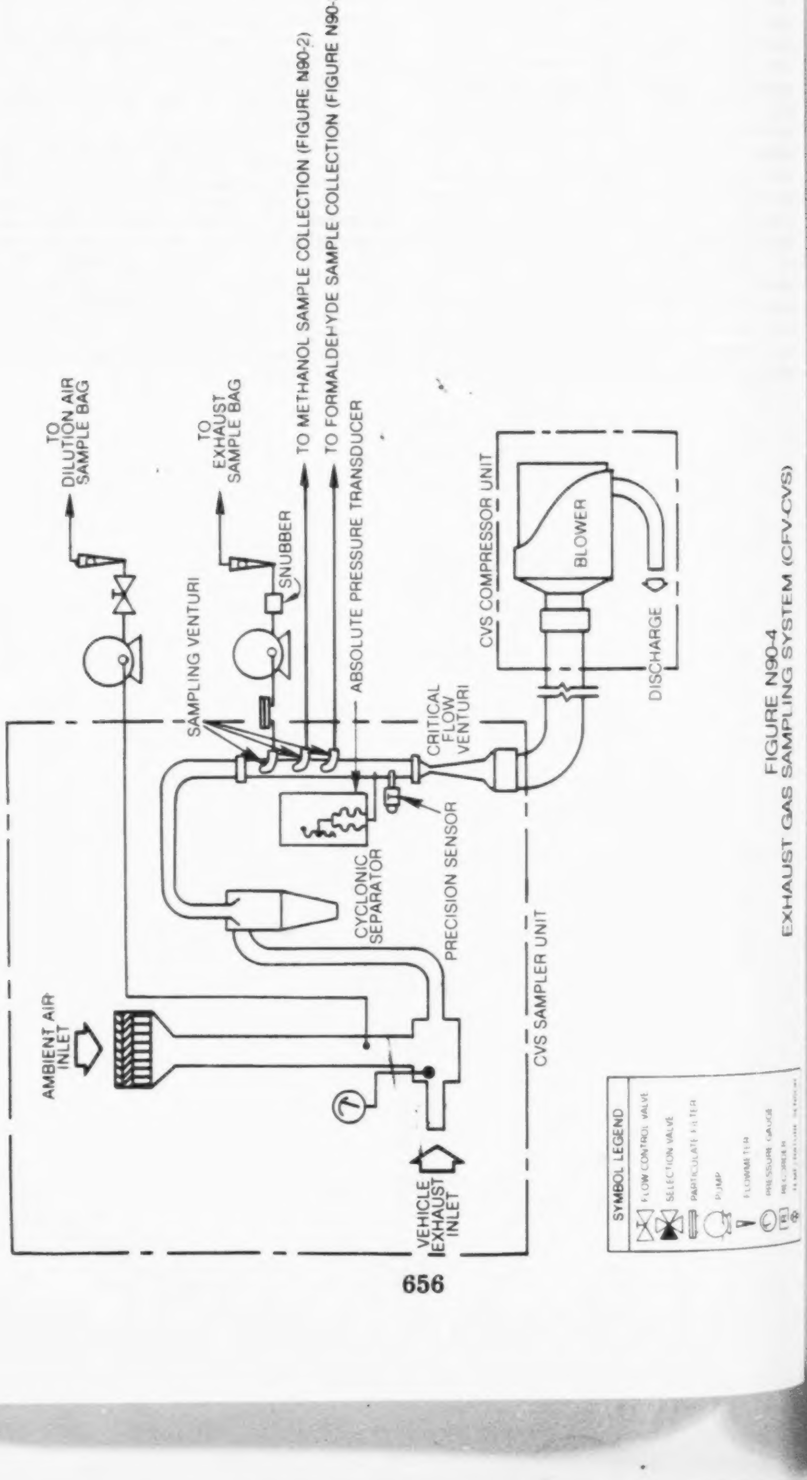

AMBIENT AIR INLET
VEHICLE EXHAUST INLET
CVS SAMPLER UNIT
CYCLONIC SEPARATOR
PRECISION SENSOR
SAMPLING VENTURI
CRITICAL FLOW VENTURI
ABSOLUTE PRESSURE TRANSDUCER
SNUBBER
TO DILUTION AIR SAMPLE BAG
TO EXHAUST SAMPLE BAG
TO METHANOL SAMPLE COLLECTION (FIGURE N90-2)
TO FORMALDEHYDE SAMPLE COLLECTION (FIGURE N90-3)
CVS COMPRESSOR UNIT
BLOWER
DISCHARGE
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
RECORDER

FIGURE N90-4
EXHAUST GAS SAMPLING SYSTEM (CFV-CVS)

(5) *Other systems.* Other sampling and/or analytical systems including the systems described in § 86.1310 for petroleum-fueled diesel engines may be used if shown to yield equivalent results, and if approved in advance by the Administrator.

(6) Since various configurations can produce equivalent results, exact conformance with these drawings is not required. Additional components such as instruments, valves, solenoids, pumps and switches may be used to provide additional information and coordinate the functions of the component systems. Other components such as snubbers, which are not needed to maintain accuracy on some systems, may be excluded if their exclusion is based upon good engineering judgment.

(b) *Component description, PDP-CVS.* The PDP CVS, Figure N90-1, consists of a dilution air filter and mixing assembly, heat exchanger, positive displacement pump, sampling systems (see Figure N90-2 for methanol sampling system and Figure N90-3 for formaldehyde sampling system) including sampling lines which are heated to 235°±15 °F (113°±8 °C) in the case of the methanol-fueled engine (heating of the sample lines may be omitted, provided the methanol and formaldehyde sample collection systems are close coupled to the probes thereby preventing loss of sample due to cooling and resulting condensation in the sample lines), and associated valves, pressure and temperature sensors. The PDP-CVS shall conform to the following requirements:

(1) Exhaust system backpressure must not be artificially lowered by the CVS or dilution air inlet system. Measurements to verify this should be made in the raw exhaust immediately upstream of the inlet to the CVS. (For diesel engines, this measurement should be made immediately upstream of the backpressure set device.) This verification requires the continuous measurement and comparison of raw exhaust static pressure observed during a transient cycle, both with and without the operating CVS. Static pressure measured with the operating CVS system shall remain within ±5 inches of water (1.2 kPa) of the static pressure measured without connection to the CVS, at identical moments in the test cycle. (Sampling systems capable of maintaining the static pressure to within ±1 inch of water (0.25 kPa) will be used by the Administrator if a written request substantiates the need for this closer tolerance.) This requirement is essentially a design specification for the CVS/dilution air inlet system, and should be performed as often as good engineering practice dictates (*e.g.*, after installation of an uncharacterized CVS, addition of an unknown inlet restriction on the dilution air, *etc.*).

(2) The gas mixture temperature, measured at a point immediately ahead of the positive displacement pump and after the heat exchanger, shall be maintained within ±10 °F (±5.6 °C) of the average operating temperature observed during the test. (The average operating temperature may be estimated from the average operating temperature from similar tests.) The temperature measuring system (sensors and readout) shall have an accuracy and precision of ±3.4 °F (1.9 °C).

(3) The pressure gauges shall have an accuracy and precision of ±3 mm Hg (0.4 kPa).

(4) The flow capacity of the CVS shall be large enough to eliminate water condensation in the system. This is especially critical in the case of methanol-fueled engines; see "Calculation of Emissions and Fuel Economy When Using Alternative Fuels," EPA 460/3-83-009.

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow. A single dilution air sample, covering the total test period, may be collected for determination of formaldehyde background (methanol-fueled engines).

(6) The methanol sample collection system and the formaldehyde sample collection system shall each be of sufficient capacity so as to collect samples of adequate size for analysis without significant impact on the volume of dilute exhaust passing through the PDP.

(c) *Component description, CFV.* The CFV sample system, Figure N90-4, consists of a dilution air filter (optional) and mixing assembly, cyclone particulate separator (optional), unheated sampling venturies for the bag, methanol and formaldehyde samples from methanol-fueled engines, heated sample lines (235°±15 °F (113°±8 °C)) for the methanol and formaldehyde samples from methanol-fueled vehicles (heating of the sample lines may be omitted provided, the methanol and formaldehyde sample collection systems are close coupled to the probes thereby preventing loss of samples due to cooling and resulting condensation in the sample lines), critical flow venturi, and assorted valves, and pressure and temperature sensors. The CFV sample system shall conform to the following requirements:

(1) Static pressure variations in the raw exhaust shall conform to the specifications detailed in paragraph (b)(1) of this section.

(2) The temperature measuring system (sensors and readout) shall have an accuracy and precision of ±3.4 °F (±1.9 °C). The temperature measuring system used in a CVS without a heat exchanger shall have a response time of 1.50 seconds to 62.5 percent of a temperature change (as measured in hot silicone oil). There is no response time requirement for a CVS equipped with a heat exchanger.

(3) The pressure measuring system (sensors and readout) shall have an accuracy and precision of ±3 mm Hg (0.4 kPa).

(4) The flow capacity of the CVS shall be large enough to prevent water condensation in the system. This is especially important with methanol-fueled engines: see "Calculation of Emissions and Fuel Economy When Using Alternative Fuels," EPA 460/3-83-009.

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow. A single dilution air sample covering the total test period may be collected for determination of formaldehyde background (methanol-fueled engines).

(6) The methanol sample collection system and the formaldehyde sample collection system shall each be of sufficient capacity so as to collect samples of adequate size for analysis without significant impact on the volume of dilute exhaust passing through the CFV.

[54 FR 14572, Apr. 11, 1989]

§ 86.1310-84 Exhaust gas sampling and analytical system; diesel-fueled engines.

(a) *General.* The exhaust gas sampling system described in this paragraph is designed to measure the true mass of both gaseous and particulate emissions in the exhaust of heavy-duty diesel-fueled engines. This system utilizes the CVS concept (described in § 86.1309-84) of measuring mass emissions of NO_x, CO, CO_2, and particulate. A continuously integrated system is required for HC measurement, and is allowed for NO_x, CO, and CO_2. The mass of gaseous emissions is determined from the sample concentration and total flow over the test period. As an option, the measurement of total fuel mass consumed over a cycle may be substituted for the exhaust measurement of CO_2. General requirements are as follows:

(1) This sampling system requires the use of a PDP-CVS, or a CFV-CVS with either a heat exchanger or electronic flow compensation. Figure N84-3 is a schematic drawing of the PDP system. Figure N84-4 is a schematic drawing of the CFV system.

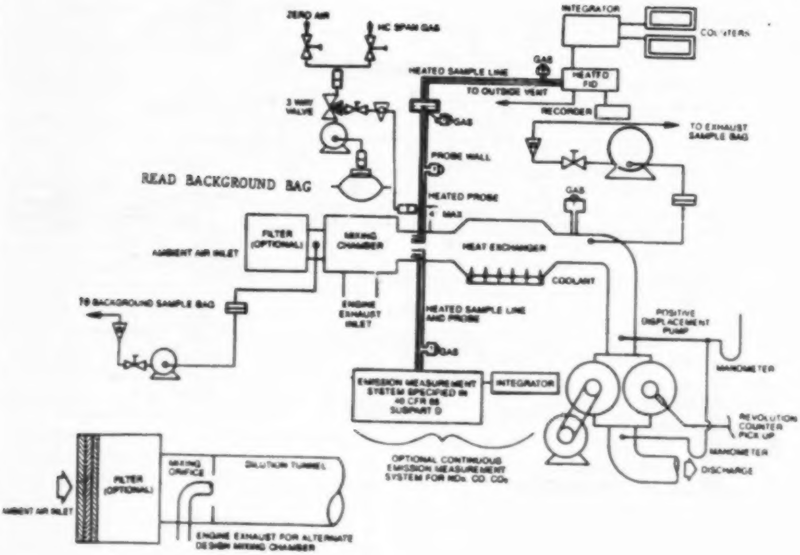

ZERO AIR
HC SPAN GAS
INTEGRATOR
COUNTERS
GAS
HEATED SAMPLE LINE
HEATED FID
TO OUTSIDE VENT
3 WAY VALVE
RECORDER
GAS
TO EXHAUST SAMPLE BAG
PROBE WALL
READ BACKGROUND BAG
HEATED PROBE
4" MAX
GAS
FILTER (OPTIONAL)
MIXING CHAMBER
AMBIENT AIR INLET
HEAT EXCHANGER
COOLANT
TO BACKGROUND SAMPLE BAG
ENGINE EXHAUST INLET
HEATED SAMPLE LINE AND PROBE
POSITIVE DISPLACEMENT PUMP
GAS
MANOMETER
EMISSION MEASUREMENT SYSTEM SPECIFIED IN 40 CFR 86 SUBPART D
INTEGRATOR
REVOLUTION COUNTER PICK UP
MANOMETER
OPTIONAL CONTINUOUS EMISSION MEASUREMENT SYSTEM FOR NOx CO CO2
DISCHARGE
MIXING ORIFICE
DILUTION TUNNEL
FILTER (OPTIONAL)
AMBIENT AIR INLET
ENGINE EXHAUST FOR ALTERNATE DESIGN MIXING CHAMBER

FIGURE N84-3: GASEOUS EMISSIONS SAMPLING SYSTEM (PDP-CVS)

(For diesel engines only)

(see figure N84-5 for symbol legend)

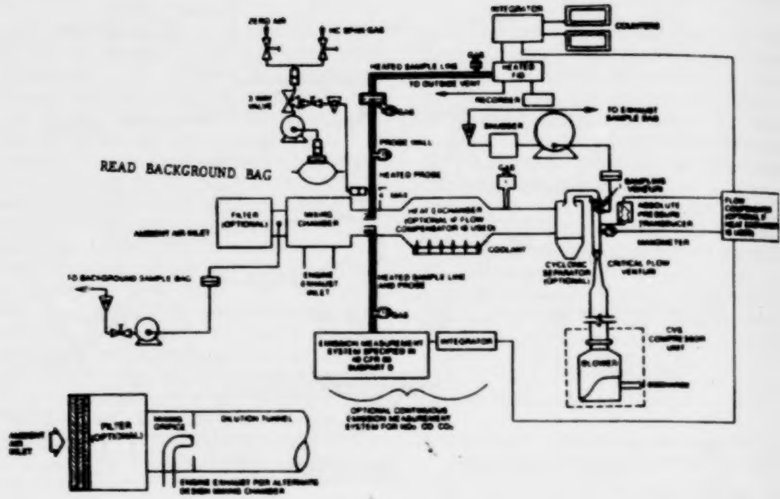

INTEGRATOR
COUNTERS
ZERO AIR
HC SPAN GAS
3 WAY VALVE
HEATED SAMPLE LINE
HEATED FID
TO OUTSIDE VENT
RECORDER
TO EXHAUST SAMPLE BAG
PROBE WALL
HEATED PROBE
READ BACKGROUND BAG
SAMPLING VENTURI
ABSOLUTE PRESSURE TRANSDUCER
FLOW COMPENSATOR (OPTIONAL IF HEAT EXCHANGER IS USED)
AMBIENT AIR INLET
FILTER (OPTIONAL)
MIXING CHAMBER
HEAT EXCHANGER (OPTIONAL IF FLOW COMPENSATOR IS USED)
COOLANT
MANOMETER
CYCLONIC SEPARATOR (OPTIONAL)
CRITICAL FLOW VENTURI
TO BACKGROUND SAMPLE BAG
ENGINE EXHAUST INLET
HEATED SAMPLE LINE AND PROBE
CVS COMPRESSOR UNIT
EMISSION MEASUREMENT SYSTEM SPECIFIED IN 40 CFR 86 SUBPART D
INTEGRATOR
BLOWER
DISCHARGE
OPTIONAL CONTINUOUS EMISSION MEASUREMENT SYSTEM FOR NOx CO CO2
AMBIENT AIR INLET
FILTER (OPTIONAL)
MIXING ORIFICE
DILUTION TUNNEL
ENGINE EXHAUST FOR ALTERNATE DESIGN MIXING CHAMBER

Figure N84-4 GASEOUS EMISSIONS SAMPLING SYSTEM (CFV-CVS)

(For diesel engines only)

(See figure N84-5 for symbol legend)

(2) The HC analytical system for diesel-fueled engines requires a heated flame ionization detector (HFID) and heated sample system.

(i) The HFID sample must be taken directly from the diluted exhaust stream through a heated probe and integrated continuously over the test cycle. Unless compensation for varying flow is made, the HFID must be used with a constant flow system to ensure a representative sample.

(ii) The heated probe shall be located downstream of a mixing chamber that provides a uniform sample distribution across the CVS duct.

(iii) The dilution tunnel similar to those used for diesel particulate sampling may be used as a mixing chamber.

(3) Bag sampling (§ 86.1309–84) and analytical (§ 86.1311–84) capabilities as shown in N84-3 (or Figure N84-4) are required.

(4) *Option.* Continuously integrated measurements of diluted NO_x, CO, and CO_2 are permitted and can be used to determine compliance with applicable emission standards. Minimum requirements and technical specifications are given in paragraph (b)(5) of this section.

(5) Since various configurations can produce equivalent results, exact conformance with these drawings is not required. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems. Other components such as snubbers, which are not needed to maintain accuracy on some systems, may be excluded if their exclusion is based upon good engineering judgment.

(6) Other sampling and/or analytical systems may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(b) *Component description.* The components necessary for diesel exhaust sampling shall meet the following requirements:

(1) The PDP-CVS, shall conform to all of the requirements listed for the exhaust gas PDP-CVS (§ 86.1309–84(b)). The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream at a temperature of 375° F (191° C) or less at the sampling zone.

(2) The CFV-CVS shall conform to all of the requirements listed for the exhaust gas CFV-CVS (§ 86.1309–84(c)), along with the following requirements:

(i) The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream at a temperature of 375° F (191° C) or less at the sampling zone.

(ii) A heat exchanger or an electronic flow compensator is required (see Figure N84-4).

(iii) When a heat exchanger is used, the gas mixture temperature, measured at a point immediately ahead of the critical flow venturi, shall be within ±20° F (11° C) of the average operating temperature observed during the test. The temperature measuring system (sensors and readout) shall have an accuracy and precision of ±3.4° F (1.9° C). For systems utilizing a flow compensator to maintain proportional flow, the requirement for maintaining constant temperature is not necessary.

(3) Continuous HC measurement system.

(i) The continuous HC sample system (as shown in Figure N84-3 or N84-4) uses an "overflow" zero and span system. In this type of system, excess zero or span gas spills out of the probe when zero and span checks of the analyzer are made. The "overflow" system may also be used to calibrate the HC analyzer per § 86.1321–84(b), although this is not required.

(ii) No other analyzers may draw a sample from the continuous HC sample probe, line or system, unless a common sample pump is used for all analyzers and the single sample line system design reflects good engineering practice.

(iii) The overflow gas flow rate into the sample line shall be at least 105 percent of the sample system flow rate.

(iv) The overflow gases shall enter the heated sample line as close as practicable to the outside surface of the CVS duct or dilution tunnel.

(v) The continuous hydrocarbon probe shall be:

best copy available

(A) Installed in the dilute stream at a point where the dilution air and exhaust are well mixed.

(B) Sufficiently distant (radially) from other probes and the tunnel wall so as to be free from the influence of any wakes or eddies.

(C) Heated over the entire length to maintain a 375°±20° F (191°±11° C) *wall* temperature. (Insulation and other techniques may be used to maintain the temperature.)

(D) 0.19 in (0.48 cm) minimum inside diameter.

(E) Free from cold spots (i.e., free from spots where the probe wall temperature is less than 355° F (180° C)).

(vi) The dilute exhaust gas flowing in the total hydrocarbon sample system shall be:

(A) At 375°±10° F (191°±6° C) immediately before the heated filter. This *gas* temperature will be determined by a temperature sensor located immediately upstream of the filter. The sensor and its readout shall have an accuracy and precision of ±3.4° F (1.9° C).

(B) At 375°±10° F (191°±6° C) immediately before the HFID. This *gas* temperature will be determined by a temperature sensor located at the exit of the heated sample line. The sensor and its readout shall have an accuracy and precision of ±3.4° F (1.9° C).

(vii) The response time of the continuous measurement system shall be no greater than:

(A) 1.5 seconds from an instantaneous step change at the port entrance to the analyzer to within 90 percent of the step change.

(B) 20.0 seconds from an instantaneous step change at the entrance to the sample probe or overflow span gas port to within 90 percent of the step change. Analysis system response time shall be coordinated with CVS flow fluctuations and sampling time/test cycle offsets if necessary.

(C) For the purpose of verification of response times, the step change shall be at least 60 percent of full-scale chart deflection.

(4) Mixing chamber.

(i) The mixing chamber shall be designed to fully mix the dilution air and exhaust gas while minimizing HC hang up in the system between the entrance of the exhaust gas into the system and the HC sample probe.

(ii) A dilution tunnel similar to those used for diesel particulate testing may be used as a mixing chamber (see Figures N84-3 and N84-4). It shall conform to the following criteria:

(A) The tunnel shall be of small enough diameter to cause turbulent flow (Reynolds Number greater than 4000) and of sufficient length to cause complete mixing of the exhaust and dilution air;

(B) The engine exhaust shall be directed downstream at the point where it is introduced into the dilution tunnel;

(C) The tunnel shall be at least 18.0 inches (45.7 cm) in diameter; unless a double dilution tunnel is used. Good engineering judgment shall be used to retest other tunnel diameters.

(D) The tunnel shall be constructed of electrically conductive material which does not react with the exhaust components, and electrically grounded;

(E) The temperature of the diluted exhaust stream inside of the dilution tunnel shall be sufficient to prevent water condensation;

(F) The continuous hydrocarbon probe shall be installed in the dilution tunnel at a point where the dilution air and exhaust are well mixed (i.e. approximately 10 tunnel diameters downstream of the point where the exhaust gas enters the dilution tunnel);

(G) All other factors of the continuous HC measurement system (paragraph (b)(3) of this section) shall meet the requirements specified in this subpart for diesel HC measurement systems.

(5) Optional continuously integrated NO_x, CO, and CO_2 measurement system.

(i) The sample probe shall:

(A) Be in the same plane as the continuous HC probe, but shall be sufficiently distant (radially) from other probes and the tunnel wall so as to be free from the influences of any wakes or eddies.

(B) Be heated and insulated over the entire length, to prevent water condensation, to a minimum temperature of 55° C (131° F). Sample *gas* temperature immediately before the first filter in the system shall be at least 55° C (131° F).

(ii) The continuous NO_x, CO, or CO_2 sampling and analysis system shall conform to the specifications of 40 CFR Part 86, Subpart D, with the following exceptions and revisions:

(A) The system components required to be heated by Subpart D need only be heated to prevent water condensation; the minimum component temperature shall be 55° C (131° F).

(B) The system response defined in § 86.329-79 shall be no greater than 20.0 seconds. Analysis system response time shall be coordinated with CVS flow fluctuations and sampling time/test cycle offsets if necessary.

(C) Alternative NO_x measurement techniques outlined in § 86.346-79 are not permitted for NO_x measurement in this subpart.

(D) All analytical gases shall conform to the specifications of § 86.1314-84.

(E) Any range on a linear analyzer below 155 ppm shall have and use a calibration curve conforming to § 86.330-79.

(F) The measurement accuracy requirements specified in § 86.338-79 are superseded by those specified in § 86.1338-84.

(iii) The chart deflections of analyzers with non-linear calibration curves shall be converted to concentration values by the calibration curve(s) specified in Subpart D (§ 86.330-79) before flow correction (if used) and subsequent integration takes place.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48143, Dec. 10, 1984]

§ 86.1310-88 Exhaust gas sampling and analytical system; diesel engines.

(a) *General.* The exhaust gas sampling system described in this paragraph is designed to measure the true mass of both gaseous and particulate emissions in the exhaust of heavy-duty diesel engines. This system utilizes the CVS concept (described in § 86.1309-84) of measuring mass emissions of CO, CO_2, and particulate. A continuously integrated system is required for HC and NO_x measurement, and is allowed for CO, and CO_2. The mass of gaseous emissions is determined from the sample concentration and total flow over the test period. The mass of particulate emissions is determined from a proportional mass sample collected on a filter and from the sample flow and total flow over the test period. As an option, the measurement of total fuel mass consumed over a cycle may be substituted for the exhaust measurement of CO_2. General requirements are as follows:

(1) This sampling system requires the use of a PDP-CVS and a heat exchanger, or a CFV-CVS with either a heat exchanger or electronic flow compensation. Figure N88-3 is a schematic drawing of the PDP system. Figure N88-4 is a schematic drawing of the CFV system.

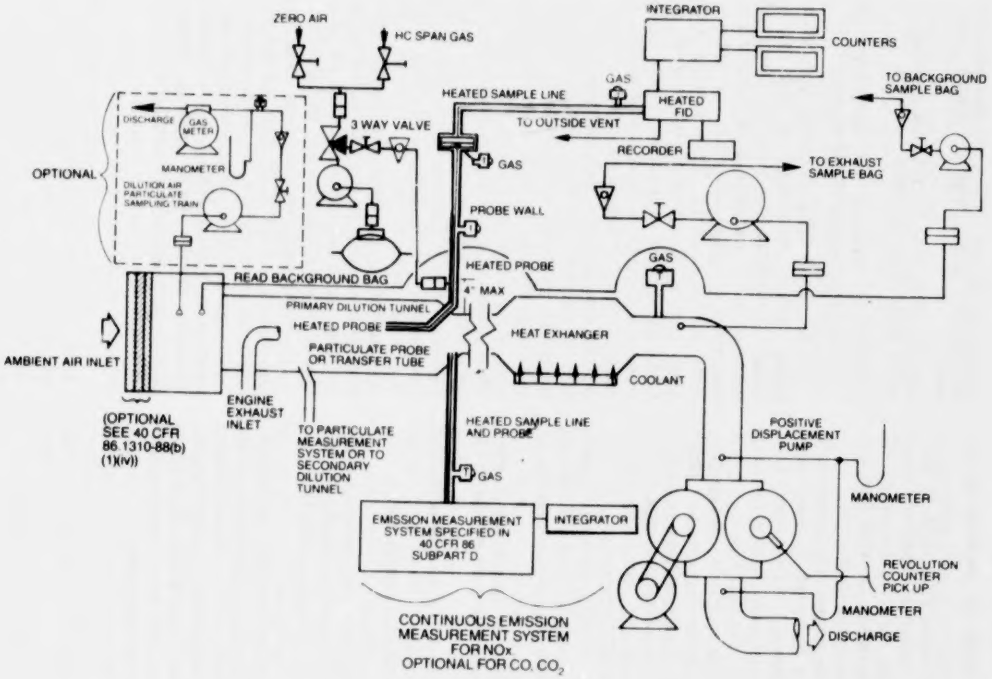

ZERO AIR
HC SPAN GAS
INTEGRATOR
COUNTERS
TO BACKGROUND SAMPLE BAG
GAS
HEATED SAMPLE LINE
HEATED FID
TO OUTSIDE VENT
RECORDER
3 WAY VALVE
GAS
TO EXHAUST SAMPLE BAG
DISCHARGE
GAS METER
MANOMETER
OPTIONAL
DILUTION AIR PARTICULATE SAMPLING TRAIN
PROBE WALL
GAS
HEATED PROBE
READ BACKGROUND BAG
4" MAX
PRIMARY DILUTION TUNNEL
HEATED PROBE
HEAT EXHANGER
AMBIENT AIR INLET
PARTICULATE PROBE OR TRANSFER TUBE
COOLANT
ENGINE EXHAUST INLET
(OPTIONAL SEE 40 CFR 86.1310-88(b) (1)(iv))
TO PARTICULATE MEASUREMENT SYSTEM OR TO SECONDARY DILUTION TUNNEL
HEATED SAMPLE LINE AND PROBE
GAS
POSITIVE DISPLACEMENT PUMP
MANOMETER
EMISSION MEASUREMENT SYSTEM SPECIFIED IN 40 CFR 86 SUBPART D
INTEGRATOR
REVOLUTION COUNTER PICK UP
MANOMETER
DISCHARGE
CONTINUOUS EMISSION MEASUREMENT SYSTEM FOR NOx OPTIONAL FOR CO, CO₂

FIGURE N88-3
GASEOUS EMISSIONS SAMPLING SYSTEM (PDP-CVS)
(FOR DIESEL ENGINES ONLY)
(SEE FIGURE N84-5 FOR SYMBOL LEGEND)

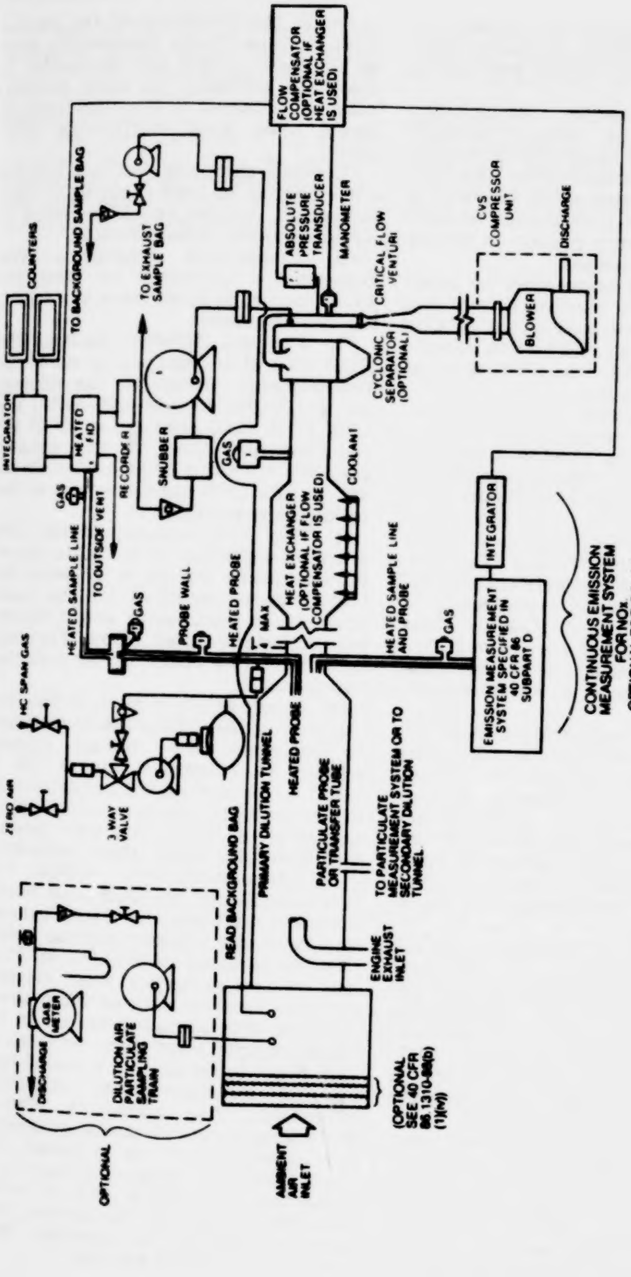

INTEGRATOR
COUNTERS
TO BACKGROUND SAMPLE BAG
HEATED FID
RECORDER
GAS
TO OUTSIDE VENT
HEATED SAMPLE LINE
GAS
HC SPAN GAS
ZERO AIR
3 WAY VALVE
TO EXHAUST SAMPLE BAG
SNUBBER
PROBE WALL
HEATED PROBE
GAS
4 MAX
HEAT EXCHANGER (OPTIONAL IF FLOW COMPENSATOR IS USED)
COOLANT
CYCLONIC SEPARATOR (OPTIONAL)
ABSOLUTE PRESSURE TRANSDUCER
MANOMETER
CRITICAL FLOW VENTURI
FLOW COMPENSATOR (OPTIONAL IF HEAT EXCHANGER IS USED)
CVS COMPRESSOR UNIT
DISCHARGE
BLOWER
INTEGRATOR
HEATED SAMPLE LINE AND PROBE
GAS
EMISSION MEASUREMENT SYSTEM SPECIFIED IN 40 CFR 86 SUBPART D
CONTINUOUS EMISSION MEASUREMENT SYSTEM FOR NOx OPTIONAL FOR CO, CO2
HEATED PROBE
PRIMARY DILUTION TUNNEL
READ BACKGROUND BAG
PARTICULATE PROBE OR TRANSFER TUBE
TO PARTICULATE MEASUREMENT SYSTEM OR TO SECONDARY DILUTION TUNNEL
ENGINE EXHAUST INLET
DISCHARGE
GAS METER
DILUTION AIR PARTICULATE SAMPLING TRAIN
OPTIONAL
AMBIENT AIR INLET
(OPTIONAL SEE 40 CFR 86.1310-88(b) (1)(v))

FIGURE N88-4
GASEOUS EMISSIONS SAMPLING SYSTEM (CFV-CVS)
(FOR DIESEL ENGINES ONLY)
(SEE FIGURE N84-5 FOR SYMBOL LEGEND)

(2) The HC analytical system for diesel engines requires a heated flame ionization detector (HFID) and heated sample system.

(i) The HFID sample must be taken directly from the diluted exhaust stream through a heated probe and integrated continuously over the test cycle. Unless compensation for varying flow is made, the HFID must be used with a constant flow system to ensure a representative sample.

(ii) The heated probe shall be located in the primary dilution tunnel and far enough downstream of the mixing chamber to ensure a uniform sample distribution across the CVS duct at the point of sampling.

(3) The CO and CO_2 analytical system for diesel engines requires:

(i) Bag sampling (§ 86.1309-84) and analytical (§ 86.1311-84) capabilities as shown in Figure N88-3 (or Figure N88-4), or

(ii) Continuously integrated measurement of diluted CO and CO_2 meeting the minimum requirements and technical specifications contained in paragraph (b)(5) of this section. Unless compensation for varying flow is made, a constant flow system must be used to ensure a representative sample.

(4) The NO_x analytical system for diesel engines requires a continuously integrated measurement of diluted NO_x meeting the minimum requirements and technical specifications contained in paragraph (b)(5) of this section. Unless compensation for varying flow is made, a constant flow system must be used to ensure a representative sample.

(5) The mass of particulate in the exhaust is determined via filtration. The particulate sampling system requires dilution of the exhaust in either one or two steps to a temperature never greater than 125° F (51.7° C) at the primary sample filter. A backup filter provides a confirmation of sufficient filtering efficiency.

(6) Since various configurations can produce equivalent results, exact conformance with these drawings is not required. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems. Other components, such as snubbers, which are not needed to maintain accuracy on some systems, may be excluded if their exclusion is based upon good engineering judgment.

(7) Other sampling and/or analytical systems may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(b) *Component description.* The components necessary for diesel exhaust sampling shall meet the following requirements:

(1) *Exhaust dilution system.* The PDP-CVS shall conform to all of the requirements listed for the exhaust gas PDP-CVS in § 86.1309-84(b). The CFV-CVS shall conform to all of the requirements listed for the exhaust gas CFV-CVS in § 86.1309-84(c). In addition, the CVS must conform to the following requirements:

(i) The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream at or below the temperatures required for the measurement of particulate and hydrocarbon emissions noted below. This may be achieved by either of the following two methods.

(A) *Single-dilution method.* The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream at a temperature of 125° F (51.7° C) or less at the sampling zone in the primary dilution tunnel. Direct sampling of the particulate material may then take place (Figure N88-4a).

(B) *Double-dilution method.* The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream in the primary dilution tunnel at a temperature of 375° F (191° C) or less at the sampling zone. Gaseous emission samples may be taken directly from this sampling point. An exhaust sample must then be taken at this point to be diluted a second time for use in determining particulate emissions. The secondary dilution system must provide sufficient secondary dilution air to maintain the double-diluted exhaust stream at a temperature of 125° F (51.7° C) or less immediately before the primary particulate filter in the secondary dilution tunnel (Figure N88-4b).

(ii) For the CFV-CVS, either a heat exchanger or electronic flow compensation (which also includes the particulate sample flows) is required (see Figure N88-4).

(iii) For the CFV-CVS when a heat exchanger is used, the gas mixture temperature, measured at a point immediately ahead of the critical flow venturi, shall be within ±20° F (11° C) of the average operating temperature observed during the test. The temperature measuring system (sensors and readout) shall have an accuracy and precision of ±3.4° F (1.9° C). For systems utilizing a flow compensator to maintain proportional flow, the requirement for maintaining constant temperature is not necessary.

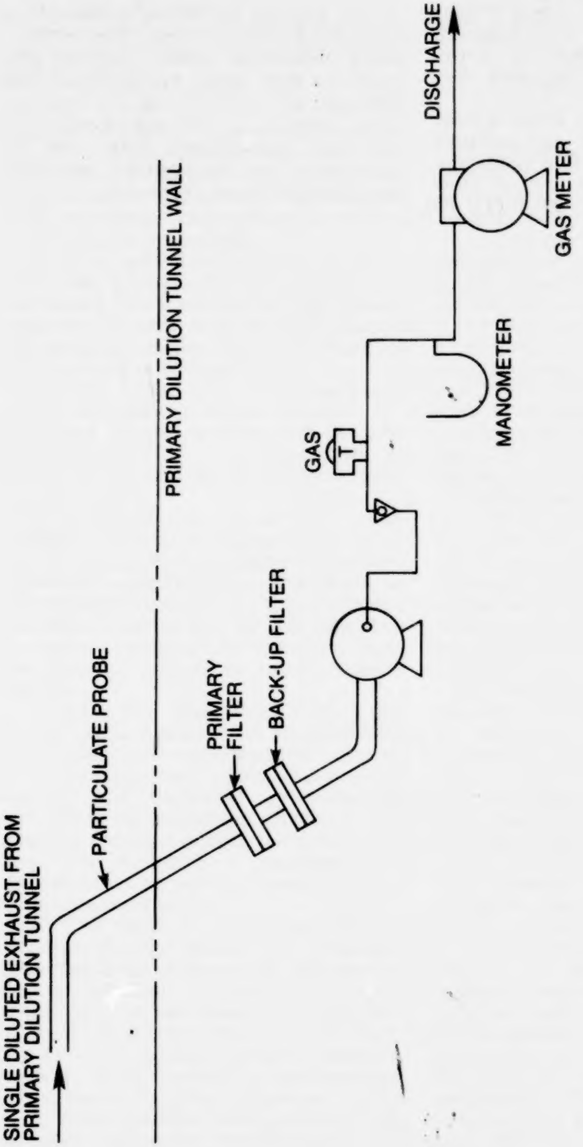

SINGLE DILUTED EXHAUST FROM PRIMARY DILUTION TUNNEL
PARTICULATE PROBE
PRIMARY DILUTION TUNNEL WALL
PRIMARY FILTER
BACK-UP FILTER
GAS
T
MANOMETER
GAS METER
DISCHARGE

FIGURE N88-4a
SINGLE DILUTION PARTICULATE MEASUREMENT SYSTEM
(FOR DIESEL ENGINES ONLY)
(SEE FIGURE N84-5 FOR SYMBOL LEGEND)

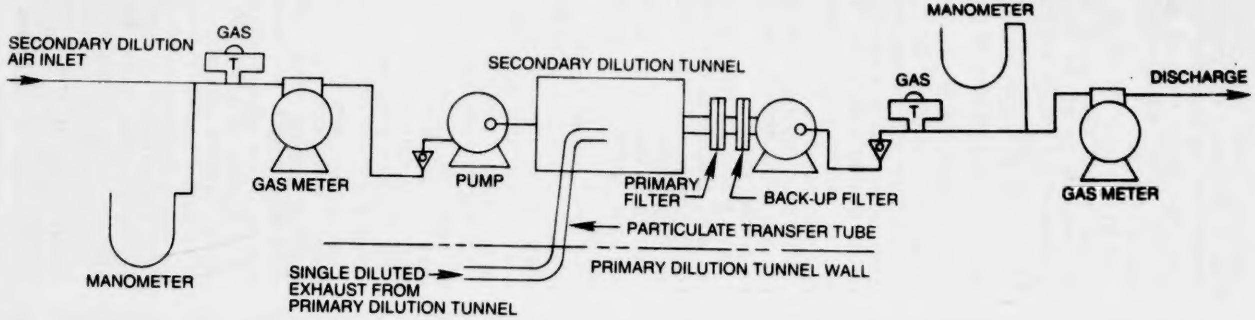

SECONDARY DILUTION AIR INLET
GAS
T
GAS METER
MANOMETER
PUMP
SECONDARY DILUTION TUNNEL
PRIMARY FILTER
BACK-UP FILTER
PARTICULATE TRANSFER TUBE
PRIMARY DILUTION TUNNEL WALL
SINGLE DILUTED EXHAUST FROM PRIMARY DILUTION TUNNEL
GAS
T
MANOMETER
GAS METER
DISCHARGE

FIGURE N88-4b
DOUBLE DILUTION PARTICULATE MEASUREMENT SYSTEM
(FOR DIESEL ENGINES ONLY)
(SEE FIGURE N84-5 FOR SYMBOL LEGEND)

(iv) The primary dilution air and secondary dilution air (if applicable):

(A) Shall have a temperature of 77°±9°F (25°±5°C). For the first 10 seconds of sampling, this specification is 77°±20°F(25°±11°C).

(B) May be filtered at the dilution air inlet.

(C) May be sampled to determine background particulate levels, which can then be subtracted from the values measured in the detailed exhaust stream.

(2) [Reserved]

(3) *Continuous HC measurement system.* (i) The continuous HC sample system (as shown in Figure N88-3 or N88-4) uses an "overflow" zero and span system. In this type of system, excess zero or span gas spills out of the probe when zero and span checks of the analyzer are made. The "overflow" system may also be used to calibrate the HC analyzer per § 86.1321-84(b), although this is not required.

(ii) No other analyzers may draw a sample from the continuous HC sample probe, line or system, unless a common sample pump is used for all analyzers and the sample line system design reflects good engineering practice.

(iii) The overflow gas flow rates into the sample line shall be at least 105 percent of the sample system flow rate.

(iv) The overflow gases shall enter the heated sample line as close as practicable to the outside surface of the CVS duct or dilution tunnel.

(v) The continuous hydrocarbon probe shall be:

(A) Installed in the primary dilution tunnel at a point where the dilution air and exhaust are well mixed (*i.e.*, approximately 10 tunnel diameters downstream of the point where the exhaust enters the dilution tunnel).

(B) Sufficiently distant (radially) from other probes and the tunnel wall so as to be free from the influence of any wakes or eddies.

(C) Heated over the entire length to maintain a 375° ±20° F (191°±11° C) *wall* temperature. (Insulation and other techniques may also be used to maintain the temperature.)

(D) 0.19 in (0.483 cm) minimum inside diameter.

(E) Free from cold spots (*i.e.*, free from spots where the probe *wall* temperature is less than 355° F (180° C)).

(vi) The dilute exhaust *gas* flowing in the total hydrocarbon sample system shall be:

(A) At 375°±10° F (191°±6° C) immediately before the heated filter. This *gas* temperature will be determined by a temperature sensor located immediately upstream of the filter. The sensor and its readout shall have an accuracy and precision of ±3.4° F (1.9° C).

(B) At 375°±10° F (191°±10° C) immediately before the HFID. This *gas* temperature will be determined by a temperature sensor located at the exit of the heated sample line. The sensor and its readout shall have an accuracy and precision of ±3.4° F (1.9° C).

(vii) The response time of the continuous measurement system shall be no greater than:

(A) 1.5 seconds from an instantaneous step change at the port entrance to the analyzer to within 90 percent of the step change.

(B) 20 seconds from an instantaneous step change at the entrance to the sample probe or overflow span gas port to within 90 percent of the step change. Analysis system response time shall be coordinated with CVS flow fluctuations and sampling time/test cycle offsets if necessary.

(C) For the purpose of verification of response times, the step change shall be at least 60 percent of full-scale chart deflection.

(4) *Primary-dilution tunnel.* (i) The primary dilution tunnel shall be:

(A) Small enough in diameter to cause turbulent flow (Reynolds Number greater than 4,000) and of sufficient length to cause complete mixing of the exhaust and dilution air.

(B) At least 18 inches (45.7 cm) in diameter with a single-dilution system or at least 8 inches (20.3 cm) in diameter with a double-dilution system;

(C) Constructed of electrically conductive material which does not react with the exhaust components; and

(D) *Electrically grounded.* (ii) The temperature of the diluted exhaust stream inside of the primary dilution tunnel shall be sufficient to prevent water condensation.

(iii) The engine exhaust shall be directed downstream at the point where it is introduced into the primary dilution tunnel.

(5) *Continuously integrated NO_x CO, and CO_2 measurement systems.* (i) The sample probe shall:

(A) Be in the same plane as the continuous HC probe, but shall be sufficiently distant (radially) from other probes and the tunnel wall so as to be free from the influences of any wakes or eddies.

(B) Heated and insulated over the entire length, to prevent water condensation, to a minimum temperature of 131° F (55° C). Sample *gas* temperature immediately before the first filter in the system shall be at least 131° F (55° C).

(ii) The continuous NO_x, CO, or CO_2 sampling and analysis system shall conform to the specifications of 40 CFR Part 86, Subpart D with the following exceptions and revisions:

(A) The system components required to be heated by Subpart D need only be heated to prevent water condensation, the minimum component temperature shall be at least 131° F (55° C))

(B) The system response defined in § 86.329-79 shall be no greater than 20 seconds. Analysis system respone time shall be coordinated with CVS flow fluctuations and sampling time/test cycle offsets, if necessary.

(C) Alternative NO_x measurement techniques outlined in § 86.346-79 are not permitted for NO_x measurement in this Subpart.

(D) All analytical gases shall conform to the specifications of § 86.1314-84.

(E) Any range on a linear analyzer below 155 ppm shall have and use a calibration curve conforming to § 86.330-79.

(F) The measurement accuracy requirements specified in § 86.338-79 are superseded by those specified in § 86.1338-84.

(iii) The chart deflections or voltage output of analyzers with non-linear calibration curves shall be converted to concentration values by the calibration curve(s) specified in Subpart D (§ 86.330-79) before flow correction (if used) and subsequent integration takes place.

(6) *Particulate sampling system.* The particulate collection system must be configured in either of two ways. The *single-dilution* method collects a proportional sample from the primary tunnel, and then passes this sample through the collection filter (Figure N88-4a). The *double-dilution* method collects a proportional sample from the primary tunnel, and then transfers this sample to a secondary dilution tunnel where the sample is further diluted; the double-diluted sample is then passed through the collection filter (Figure N88-4b). Proportionality (*i.e.*, mass flow ratio) between the primary tunnel flow rate and the sample flow rate must be maintained within ±5 percent for systems with or without flow compensation. Without flow compensation, proportional sampling is achieved by introducing the secondary dilution air at a constant mass flow rate, and removing the double-diluted sample at a constant mass flow rate. The requirements for these two systems are:

(i) *Single Dilution Method.* (A) The particulate sample probe shall be:

(*1*) Installed facing upstream at a point where the dilution air and exhaust air are well mixed (*i.e.*, on the primary tunnel centerline, approximately 10 tunnel diameters downstream of the point where the exhaust enters the primary dilution tunnel).

(*2*) Sufficiently distant (radially) from other sampling probes so as to be free from the influence of any wakes or eddies produced by the other probes.

(*3*) 0.5 in. (1.27 cm) minimum inside diameter.

(*4*) The distance from the sampling tip to the filter holder shall be at least 5 probe diameters for filters located inside the primary dilution tunnel, and not more than 40 inches (102 cm) for filters located outside the primary dilution tunnel.

(*5*) Designed to minimize the deposition of particulate in the probe (*i.e.*, bends should be as gradual as possible, protrusions (due to sensors, etc.) should be smooth and not sudden, etc.).

(B) The particulate sample pump(s) shall be located sufficiently distant from the dilution tunnel so that the inlet gas temperature is maintained at a constant temperature (±5° F (±2.8° C)) if flow compensation is not used.

(C) The gas meters or flow instrumentation shall be located sufficiently distant from the tunnel so that the inlet gas temperature remains constant (±5° F (±2.8° C)) if flow compensation is not used.

(D) Other sample flow handling and/or measurement systems may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(ii) *Double-dilution method.* (A) The particulate sample transfer tube shall be configured and installed so that:

(*1*) The inlet faces upstream in the primary dilution tunnel at a point where the primary dilution air and exhaust are well mixed (*i.e.*, on the primary tunnel centerline, approximately 10 tunnel diameters downstream of the point where the exhaust enters the primary dilution tunnel).

(*2*) The particulate sample exits on the centerline of the secondary tunnel and points downstream.

(B) The particulate sample transfer tube shall be:

(*1*) Sufficiently distant (radially) from other sampling probes (in the primary dilution tunnel) so as to be free from the influence of any wakes or eddies produced by the other probes.

(*2*) 0.5 in. (1.27 cm) minimum inside diameter.

(*3*) No longer than 36 in. (91.4 cm) from inlet plane to exit plane.

(*4*) Designed to minimize the deposition of particulate during transfer (*i.e.*, bends should be as gradual as possible, protrusions (due to sensors, etc.) should be smooth and not sudden, etc.).

(*5*) Constructed of electrically conductive material which does not react with the exhaust components, and electrically grounded.

(C) The secondary dilution air shall be at a temperature of 77°±9°F (25°±5°C). For the first 10 seconds of sampling, this specification is 77°±20°F (25°±11°C).

(D) The secondary-dilution tunnel shall be:

(*1*) 3.0 inches (7.62 cm) minimum inside diameter.

(*2*) Of sufficient length so as to provide a residence time of at least 0.25 seconds for the double-diluted sample.

(*3*) Constructed of electrically conductive material which does not react with the exhaust components, and electrically grounded.

(E) Additional dilution air must be provided so as to maintain a sample temperature of 125°F (51. 7°C) or less immediately before the primary sample filter.

(*1*) A PDP-type pump flowing filtered dilution air at a temperature of 77°±9° F (25°±5° C) and essentially constant pressure (atmospheric is acceptable) along with a gas meter or flow instrumentation for mass determination. (See § 86.1320-87 for calibration specifics.) The gas meter or flow instrumentation shall be located so that the inlet gas temperature remains 77°±9° F (25°±5° C).

(*2*) A choked critical flow orifice flowing filtered dilution air. For mass determination, a gas meter or other flow instrumentation is acceptable. The gas meter or flow instrumentation shall be located so that the inlet gas temperature remains at 77°±9° F (25°±5° C).

(F) The primary filter holder shall be located within 12.0 in. (30.5 cm) of the exit of the secondary dilution tunnel.

(G) Other sampling flow handling and/or measurement systems may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(7) *Particulate sampling filters.* (i) Fluorocarbon-coated glass fiber filters or fluorocarbon-based (membrane) filters are required.

(ii) Particulate filters must have a minimum diameter of 70 mm (60 mm stain diameter). Larger diameter filters are acceptable.

(iii) The dilute exhaust will be simultaneously sampled by a pair of filters (one primary and one back-up filter) during the cold-start test and by a second pair of filters during the hot-start test. The back-up filter holder shall be located no more than 4 inches downstream of the primary filter holder. The primary and back-up filters shall not be in contact with each other.

(iv) The recommended minimum loading on a primary 70 mm filter is 5.3 milligrams. Equivalent loadings (*i.e.*, mass/stain area) are recommended for larger filters. For equivalency calculations assume the 70 mm filter has a 60 mm strain diameter.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10694, Mar. 15, 1985, as amended at 51 FR 24611, July 7, 1986; 52 FR 47870, Dec. 16, 1987]

§ 86.1310-90 Exhaust gas sampling and analytical system; petroleum-fueled and methanol-fueled diesel engines.

(a) *General.* The exhaust gas sampling system described in this paragraph is designed to measure the true mass of both gaseous and particulate emissions in the exhaust of petroleum-fueled and methanol-fueled heavy-duty diesel engines. This system utilizes the CVS concept (described in § 86.1309) of measuring mass emissions of HC, CH_3OH and HCHO from methanol-fueled engines and CO, CO_2, and particulate from both fuel types. A continuously integrated system is required for HC (petroleum-fueled engines) and NOx (petroleum-fueled and methanol-fueled engines) measurement, and is allowed for all CO and CO_2 measurements plus CH_3OH, HCHO, and HC from methanol-fueled engines. The mass of gaseous emissions is determined from the sample concentration and total flow over the test period. The mass of particulate emissions is determined from a proportional mass sample collected on a filter and from the sample flow and total flow over the test period. As an option, the measurement of total fuel mass consumed over a cycle may be substituted for the exhaust measurement of CO_2. General requirements are as follows:

(1) This sampling system requires the use of a PDP-CVS and a heat exchanger, or a CFV-CVS with either a heat exchanger or electronic flow compensation. Figure N90-5 is a schematic drawing of the PDP system. Figure N90-6 is a schematic drawing of the CFV system.

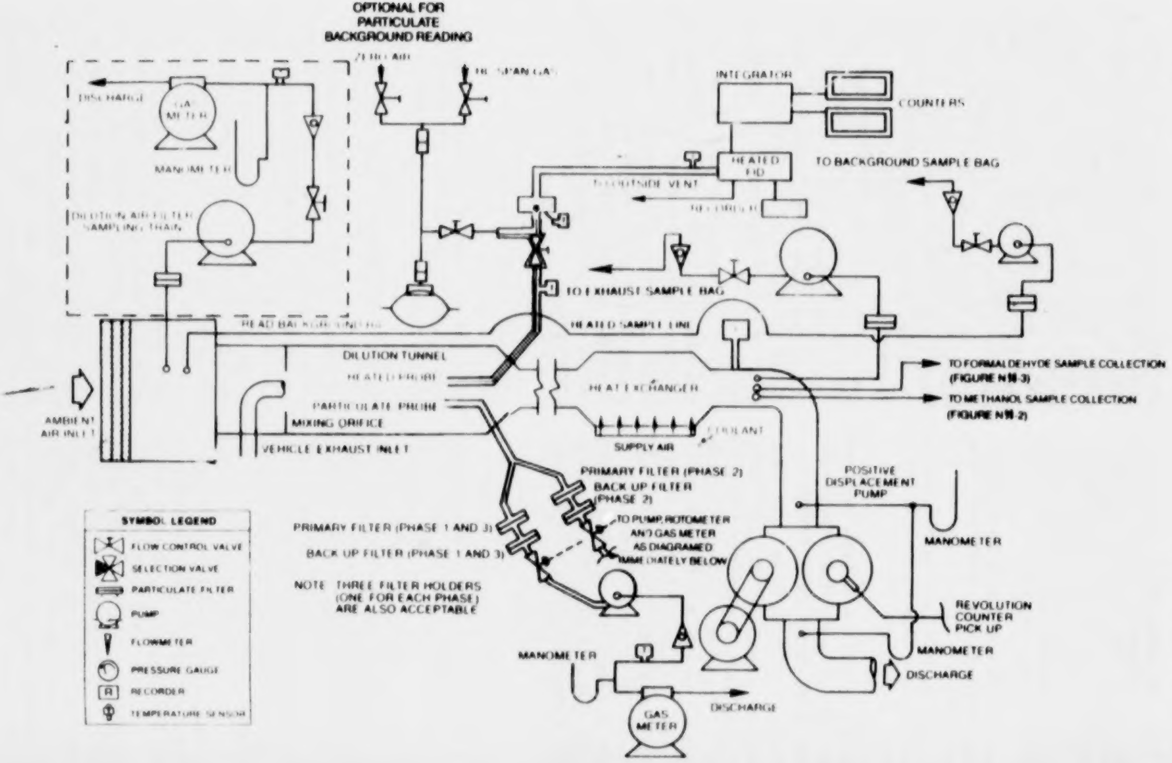

OPTIONAL FOR PARTICULATE BACKGROUND READING
ZERO AIR
HC SPAN GAS
DISCHARGE
GAS METER
MANOMETER
DILUTION AIR FILTER SAMPLING TRAIN
INTEGRATOR
COUNTERS
HEATED FID
TO BACKGROUND SAMPLE BAG
TO OUTSIDE VENT
RECORDER
TO EXHAUST SAMPLE BAG
HEAD BACKGROUND HC
HEATED SAMPLE LINE
DILUTION TUNNEL
HEATED PROBE
PARTICULATE PROBE
MIXING ORIFICE
VEHICLE EXHAUST INLET
AMBIENT AIR INLET
HEAT EXCHANGER
COOLANT
SUPPLY AIR
TO FORMALDEHYDE SAMPLE COLLECTION (FIGURE N90-3)
TO METHANOL SAMPLE COLLECTION (FIGURE N90-2)
POSITIVE DISPLACEMENT PUMP
MANOMETER
REVOLUTION COUNTER PICK UP
MANOMETER
DISCHARGE
PRIMARY FILTER (PHASE 2)
BACK UP FILTER (PHASE 2)
TO PUMP, ROTOMETER AND GAS METER AS DIAGRAMED IMMEDIATELY BELOW
PRIMARY FILTER (PHASE 1 AND 3)
BACK UP FILTER (PHASE 1 AND 3)
NOTE THREE FILTER HOLDERS (ONE FOR EACH PHASE) ARE ALSO ACCEPTABLE
MANOMETER
GAS METER
DISCHARGE
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
R
RECORDER
TEMPERATURE SENSOR

FIGURE N90-6

GASEOUS AND PARTICULATE EMISSIONS SAMPLING SYSTEM (PDP-CVS)

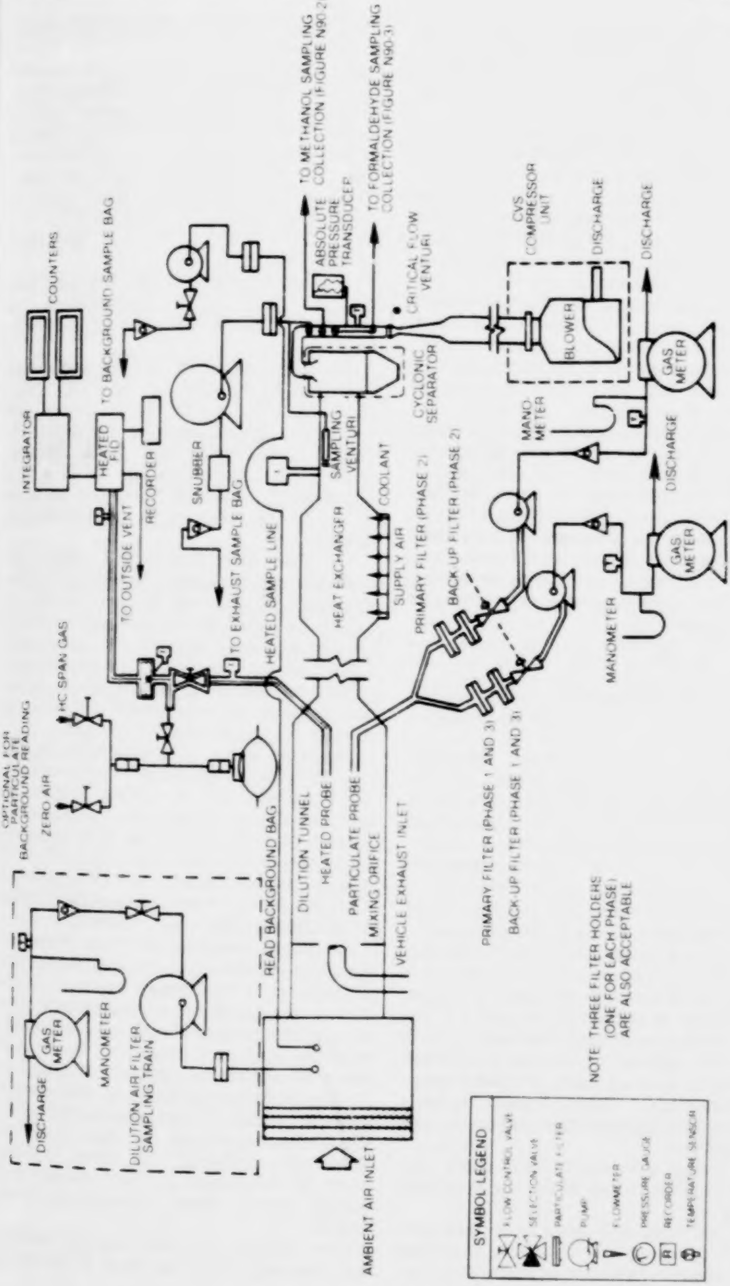

OPTIONAL FOR PARTICULATE BACKGROUND READING
ZERO AIR
HC SPAN GAS
INTEGRATOR
COUNTERS
TO BACKGROUND SAMPLE BAG
HEATED FID
RECORDER
TO OUTSIDE VENT
SNUBBER
TO EXHAUST SAMPLE BAG
HEATED SAMPLE LINE
TO METHANOL SAMPLING COLLECTION (FIGURE N90.2)
TO FORMALDEHYDE SAMPLING COLLECTION (FIGURE N90.3)
ABSOLUTE PRESSURE TRANSDUCER
CRITICAL FLOW VENTURI
CVS COMPRESSOR UNIT
DISCHARGE
BLOWER
DISCHARGE
CYCLONIC SEPARATOR
SAMPLING VENTURI
COOLANT
HEAT EXCHANGER
SUPPLY AIR
PRIMARY FILTER (PHASE 2)
BACK UP FILTER (PHASE 2)
MANO METER
GAS METER
DISCHARGE
GAS METER
MANOMETER
PRIMARY FILTER (PHASE 1 AND 3)
BACK-UP FILTER (PHASE 1 AND 3)
READ BACKGROUND BAG
DILUTION TUNNEL
HEATED PROBE
PARTICULATE PROBE
MIXING ORIFICE
VEHICLE EXHAUST INLET
DISCHARGE
GAS METER
MANOMETER
DILUTION AIR FILTER SAMPLING TRAIN
AMBIENT AIR INLET
NOTE: THREE FILTER HOLDERS (ONE FOR EACH PHASE) ARE ALSO ACCEPTABLE
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
R RECORDER
TEMPERATURE SENSOR

FIGURE N90-6
GASEOUS AND PARTICULATE EMISSIONS SAMPLING SYSTEM (CFV-CVS)

(2) The HC analytical system for petroleum-fueled diesel engines requires a heated flame ionization detector (HFID) and heated sample system (375±20 °F (191±11 °C)).

(i) The HFID sample must be taken directly from the diluted exhaust stream through a heated probe and integrated continuously over the test cycle. Unless compensation for varying flow is made, the HFID must be used with a constant flow system to ensure a representative sample.

(ii) The heated probe shall be located in the primary dilution tunnel and far enough downstream of the mixing chamber to ensure a uniform sample distribution across the CVS duct at the point of sampling.

(3) Methanol-fueled engines require the use of a heated flame ionization detector (HFID) (235°±15 °F (113°±8 °C)) for hydrocarbon analysis. With a heated FID, the hydrocarbon analysis can be made on the bag sample and the methanol and formaldehyde analyses are performed on the samples collected for these purposes (Figures N90-2 and N90-3).

NOTE: For 1990 through 1994 model year methanol-fueled engines, methanol and formaldehyde sampling may be omitted provided the hydrocarbon plus methanol analyses are performed using a FID calibrated on methanol.

(4) For methanol-fueled engines, cooling of the exhaust gases in the duct connecting the engine exhaust to the dilution tunnel shall be minimized. This may be accomplished by:

(i) Using a duct of unrestricted length maintained at 235±15 °F (113±8 °C) with heating and possibly cooling capabilities as required, or;

(ii) Using a short duct up to 12 feet long, constructed of smooth wall pipe with a minimum of flexible sections, maintained at 235±15 °F (113±8 °C) prior to the test and during periods when the engine is not in operation (insulation may remain in place and/or heating may occur during testing provided maximum temperature is not exceeded), or;

(iii) Using a smooth wall duct less than five feet long with no required heating, or;

(iv) Omitting the duct and performing the exhaust gas dilution function at the engine exhaust manifold or immediately after exhaust aftertreatment systems.

(5) Heated sample lines are required for the methanol and formaldehyde samples for methanol-fueled engines (care must be taken to prevent heating of the sample probes unless compensation for varying flow rate is made). The sample collection lines shall be heated to 235±15 °F (113±8 °C).

(6) The CO and CO_2 analytical system requires:

(i) Bag sampling (§ 86.1309) and analytical (§ 86.1311) capabilities, as shown in Figure N90-5 (or Figure N90-6), or

(ii) Continuously integrated measurement of diluted CO and CO_2 meeting the minimum requirements and technical specifications contained in paragraph (b)(5) of this section. Unless compensation for varying flow is made, a constant flow system must be used to ensure a representative sample.

(7) The NOx analytical system requires a continuously integrated measurement of diluted NOx meeting the minimum requirements and technical specifications contained in paragraph (b)(5) of this section. Unless compensation for varying flow is made, a constant flow system must be used to ensure a representative sample.

(8) The mass of particulate in the exhaust is determined via filtration. The particulate sampling system requires dilution of the exhaust in either one or two steps to a temperature never greater than 125 °F (51.7 °C) at the primary sample filter. A backup filter provides a confirmation of sufficient filtering efficiency.

(9) Since various configurations can produce equivalent results, exact conformance with these drawings is not required. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems. Other components, such as snubbers, which are not needed to maintain accuracy on some systems, may be excluded if their exclusion is based upon good engineering judgment.

(10) Other sampling and/or analytical systems may be used if shown to

yield equivalent results and if approved in advance by the Administrator.

(b) *Component description.* The components necessary for exhaust sampling shall meet the following requirements:

(1) *Exhaust dilution system.* The PDP-CVS shall conform to all of the requirements listed for the exhaust gas PDP-CVS in § 86.1309(b). The CFV-CVS shall conform to all of the requirements listed for the exhaust gas CFV-CVS in § 86.1309(c). In addition, the CVS must conform to the following requirements:

(i) The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream at or below the temperatures required for the measurement of particulate and hydrocarbon emissions noted below and at, or below, the temperatures where condensation of water in the exhaust gases could occur. This may be achieved by either of the following two methods:

(A) *Single-dilution method.* The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream at a temperature of 125 °F (51.7 °C) or less, at the sampling zone in the primary dilution tunnel and as required to prevent condensation at any point in the dilution tunnel. Direct sampling of the particulate material may then take place (Figure N90-5).

(B) *Double-dilution method.* The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream in the primary dilution tunnel at a temperature of 375 °F (191 °C) (250 °F (121 °C) for methanol fueled engines) or less at the sampling zone and as required to prevent condensation at any point in the dilution tunnel. Gaseous emission samples may be taken directly from this sampling point. An exhaust sample must then be taken at this point to be diluted a second time for use in determining particulate emissions. The secondary dilution system must provide sufficient secondary dilution air to maintain the double-diluted exhaust stream at a temperature of 125 °F (51.7 °C) or less immediately before the primary particulate filter in the secondary dilution tunnel.

(ii) For the CFV-CVS, either a heat exchanger or electronic flow compensation (which also includes the particulate sample flows) is required (see Figure N90-6).

(iii) For the CFV-CVS when a heat exchanger is used, the gas mixture temperature, measured at a point immediately ahead of the critical flow venturi, shall be within ±20 °F (±11 °C) of the average operating temperature observed during the test with the simultaneous requirement that condensation does not occur. The temperature measuring system (sensors and readout) shall have an accuracy and precision of ±3.4 °F (1.9 °C). For systems utilizing a flow compensator to maintain proportional flow, the requirement for maintaining constant temperature is not necessary.

(iv) The primary dilution air and secondary dilution air (if applicable):

(A) Shall have a temperature of 77°±9 °F (25°±5 °C). For the first 10 seconds this specification is 77°±20 °F (25°±11 °C).

(B) May be filtered at the dilution air inlet.

(C) May be sampled to determine background particulate levels, which can then be subtracted from the values measured in the detailed exhaust stream.

(2) [Reserved]

(3) *Continuous HC measurement system.* (i) The continuous HC sample system (as shown in Figure N90-7 or N90-8) uses an "overflow" zero and span system. In this type of system, excess zero or span gas spills out of the probe when zero and span checks of the analyzer are made. The "overflow" system may also be used to calibrate the HC analyzer per § 86.1321(b), although this is not required.

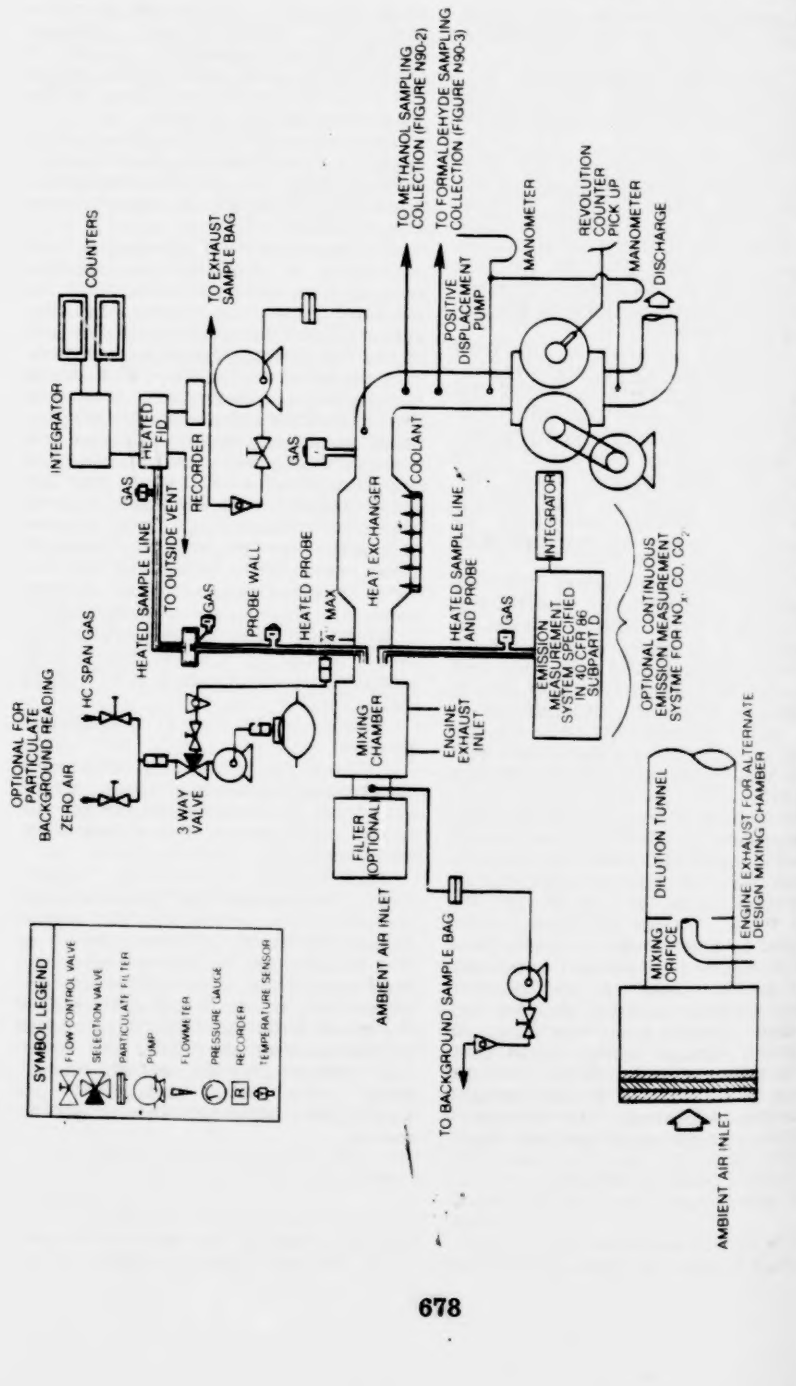

SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
R RECORDER
TEMPERATURE SENSOR
OPTIONAL FOR PARTICULATE BACKGROUND READING
ZERO AIR
HC SPAN GAS
3 WAY VALVE
INTEGRATOR
COUNTERS
HEATED FID
GAS
RECORDER
HEATED SAMPLE LINE
TO OUTSIDE VENT
GAS
PROBE WALL
HEATED PROBE
4" MAX
TO EXHAUST SAMPLE BAG
GAS
HEAT EXCHANGER
COOLANT
FILTER (OPTIONAL)
MIXING CHAMBER
ENGINE EXHAUST INLET
AMBIENT AIR INLET
TO BACKGROUND SAMPLE BAG
HEATED SAMPLE LINE AND PROBE
GAS
EMISSION MEASUREMENT SYSTEM SPECIFIED IN 40 CFR 86 SUBPART D
INTEGRATOR
OPTIONAL CONTINUOUS EMISSION MEASUREMENT SYSTME FOR NO_x, CO, CO_2
TO METHANOL SAMPLING COLLECTION (FIGURE N90-2)
TO FORMALDEHYDE SAMPLING COLLECTION (FIGURE N90-3)
POSITIVE DISPLACEMENT PUMP
MANOMETER
REVOLUTION COUNTER PICK UP
MANOMETER
DISCHARGE
AMBIENT AIR INLET
MIXING ORIFICE
DILUTION TUNNEL
ENGINE EXHAUST FOR ALTERNATE DESIGN MIXING CHAMBER

FIGURE N90-7 GASEOUS EMISSIONS SAMPLING SYSTEM (PDP-CVS)

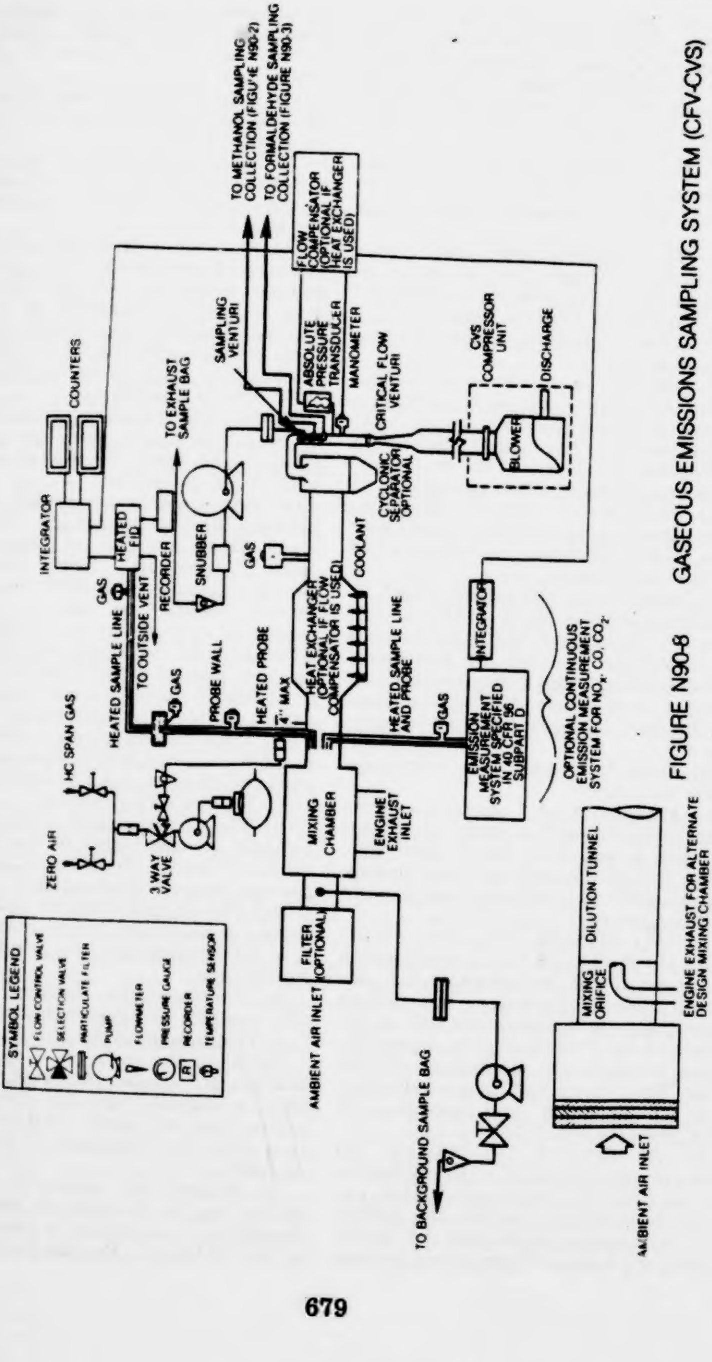

SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
RECORDER
TEMPERATURE SENSOR
ZERO AIR
HC SPAN GAS
3 WAY VALVE
HEATED SAMPLE LINE
GAS
TO OUTSIDE VENT
RECORDER
INTEGRATOR
HEATED FID
COUNTERS
TO EXHAUST SAMPLE BAG
SNUBBER
GAS
PROBE WALL
HEATED PROBE
4" MAX
HEAT EXCHANGER (OPTIONAL IF FLOW COMPENSATOR IS USED)
COOLANT
CYCLONIC SEPARATOR OPTIONAL
SAMPLING VENTURI
ABSOLUTE PRESSURE TRANSDUCER
MANOMETER
CRITICAL FLOW VENTURI
TO METHANOL SAMPLING COLLECTION (FIGURE N90-2)
TO FORMALDEHYDE SAMPLING COLLECTION (FIGURE N90-3)
FLOW COMPENSATOR (OPTIONAL IF HEAT EXCHANGER IS USED)
CVS COMPRESSOR UNIT
BLOWER
DISCHARGE
HEATED SAMPLE LINE AND PROBE
GAS
INTEGRATOR
EMISSION MEASUREMENT SYSTEM SPECIFIED IN 40 CFR 86 SUBPART D
OPTIONAL CONTINUOUS EMISSION MEASUREMENT SYSTEM FOR NO$_x$, CO, CO$_2$
MIXING CHAMBER
ENGINE EXHAUST INLET
FILTER (OPTIONAL)
AMBIENT AIR INLET
TO BACKGROUND SAMPLE BAG
MIXING ORIFICE
DILUTION TUNNEL
ENGINE EXHAUST FOR ALTERNATE DESIGN MIXING CHAMBER
AMBIENT AIR INLET

FIGURE N90-8 GASEOUS EMISSIONS SAMPLING SYSTEM (CFV-CVS)

(ii) No other analyzers may draw a sample from the continuous HC sample probe, line or system, unless a common sample pump is used for all analyzers and the sample line system design reflects good engineering practice.

(iii) The overflow gas flow rates into the sample line shall be at least 105 percent of the sample system flow rate.

(iv) The overflow gases shall enter the heated sample line as close as practicable to the outside surface of the CVS duct or dilution tunnel.

(v) The continuous hydrocarbon probe shall be:

(A) Installed in the primary dilution tunnel at a point where the dilution air and exhaust are well mixed (*i.e.*, approximately 10 tunnel diameters downstream of the point where the exhaust enters the dilution tunnel).

(B) Sufficiently distant (radially) from other probes and the tunnel wall so as to be free from the influence of any wakes or eddies.

(C) Heated over the entire length to maintain a 375°±20 °F (191°±11 °C) (235±15 °F) (113±8 °C) if continuous HC sampling is used on methanol-fueled engines) *wall* temperature. (Insulation and other techniques may also be used to maintain the temperature.)

(D) 0.19 in. (0.48 cm) minimum inside diameter.

(E) Free from cold spots (*i.e.*, free from spots where the probe *wall* temperature is less than 355 °F (180 °C)).

(vi) The dilute exhaust *gas* flowing in the continuous hydrocarbon sample system shall be:

(A) At 375°±10 °F (191°±6 °C) (235±15 °F (113±8 °C) if continuous HC is used for methanol-fueled engines) immediately before the heated filter. This *gas* temperature will be determined by a temperature sensor located immediately upstream of the filter. The sensor and its readout shall have an accuracy and precision of ±3.4 °F (±1.9 °C).

(B) At 375°±10 °F (191°±6 °C) (235±15 °F (113±8 °C) if continuous HC is used for methanol-fueled engines) immediately before the HFID. This *gas* temperature will be determined by a temperature sensor located at the exit of the heated sample line. The sensor and its readout shall have an accuracy and precision of ±3.4 °F (1.9 °C).

(vii) The response time of the continuous measurement system shall be no greater than:

(A) 1.5 seconds from an instantaneous step change at the port entrance to the analyzer to within 90 percent of the step change.

(B) 20 seconds from an instantaneous step change at the entrance to the sample probe or overflow span gas port to within 90 percent of the step change. Analysis system response time shall be coordinated with CVS flow fluctuations and sampling time/test cycle offsets if necessary.

(C) For the purpose of verification of response times, the step change shall be at least 60 percent of full-scale chart deflection.

(4) *Primary-dilution tunnel.* (i) The primary dilution tunnel shall be:

(A) Small enough in diameter to cause turbulent flow (Reynolds Number greater than 4000) and of sufficient length to cause complete mixing of the exhaust and dilution air.

(B) At least 18 inches (46 cm) in diameter with a single-dilution system or at least 8 inches (20 cm) in diameter with a double-dilution system;

(C) Constructed of electrically conductive material which does not react with the exhaust components; and

(D) Electrically grounded.

(ii) The temperature of the diluted exhaust stream inside of the primary dilution tunnel shall be sufficient to prevent water condensation.

(iii) The engine exhaust shall be directed downstream at the point where it is introduced into the primary dilution tunnel.

(5) *Continuously integrated NO_X, CO, and CO_2 measurement systems.*

(i) The sample probe shall:

(A) Be in the same plane as the continuous HC probe, but shall be sufficiently distant (radially) from other probes and the tunnel wall so as to be free from the influences of any wakes or eddies.

(B) Heated and insulated over the entire length, to prevent water condensation, to a minimum temperature of 131 °F (55 °C). Sample gas temperature immediately before the first filter in the system shall be at least 131 °F (55 °C).

(ii) The continuous NOx, CO, or CO_2 sampling and analysis system shall conform to the specifications of 40 CFR Part 86, Subpart D, with the following exceptions and revisions:

(A) The system components required to be heated by Subpart D need only be heated to prevent water condensation, the minimum component temperature shall be 131 °F (55 °C).

(B) The system response defined in § 86.329-79 shall be no greater than 20 seconds. Analysis system response time shall be coordinated with CVS flow fluctuations and sampling time/test cycle offsets, if necessary.

(C) Alternative NOx measurement techniques outlined in § 86.346-79 are not permitted for NOx measurement in this subpart.

(D) All analytical gases shall conform to the specifications of § 86.1314.

(E) Any range on a linear analyzer below 155 ppm shall have and use a calibration curve conforming to § 86.330-79.

(F) The measurement accuracy requirements specified in § 86.338-79 are superseded by those specified in § 86.1338.

(iii) The chart deflections or voltage output of analyzers with non-linear calibration curves shall be converted to concentration values by the calibration curve(s) specified in Subpart D (§ 86.330-79) before flow correction (if used) and subsequent integration takes place.

(6) *Particulate sampling system.* The particulate collection system must be configured in either of two ways. The *single-dilution* method collects a proportional sample from the primary tunnel, and then passes this sample through the collection filter. The *double-dilution* method collects a proportional sample from the primary tunnel, and then transfers this sample to a secondary dilution tunnel where the sample is further diluted; the double-diluted sample is then passed through the collection filter. Proportionality (*i.e.*, mass flow ratio) between the primary tunnel flow rate and the sample flow rate must be maintained within ±5 percent for systems with or without flow compensation. Without flow compensation, proportional sampling is achieved by introducing the secondary dilution air at a constant mass flow rate, and removing the double-diluted sample at a constant mass flow rate. The requirements for these two systems are:

(i) *Single dilution method.* (A) The particulate sample probe shall be:

(*1*) Installed facing upstream at a point where the dilution air and exhaust air are well mixed (*i.e.*, on the primary tunnel centerline, approximately 10 tunnel diameters downstream of the point where the exhaust enters the primary dilution tunnel).

(*2*) Sufficiently distant (radially) from other sampling probes so as to be free from the influence of any wakes or eddies produced by the other probes.

(*3*) 0.5 in. (1.3 cm) minimum inside diameter.

(*4*) The distance from the sampling tip to the filter holder shall be at least 5 probe diameters for filters located inside the primary dilution tunnel, and not more than 40 inches (102 cm) for filters located outside the primary dilution tunnel.

(*5*) Designed to minimize the deposition of particulate in the probe (*i.e.*, bends should be as gradual as possible, protrusions (due to sensors, *etc.*) should be smooth and not sudden, *etc.*).

(B) The particulate sample pump(s) shall be located sufficiently distant from the dilution tunnel so that the inlet gas temperature is maintained at a constant temperature (±5 °F (±2.8 °C)) if flow compensation is not used.

(C) The gas meters or flow instrumentation shall be located sufficiently distant from the tunnel so that the inlet gas temperature remains constant (±5 °F (±2.8 °C)) if flow compensation is not used.

(D) Other sample flow handling and/or measurement systems may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(ii) *Double-dilution method.* (A) The particulate sample transfer tube shall be configured and installed so that:

(*1*) The inlet faces upstream in the primary dilution tunnel at a point where the primary dilution air and exhaust are well mixed (*i.e.*, on the primary tunnel centerline, approximately 10 tunnel diameters downstream of the point where the exhaust enters the primary dilution tunnel).

(*2*) The particulate sample exits on the centerline of the secondary tunnel and points downstream.

(B) The particulate sample transfer tube shall be:

(*1*) Sufficiently distant (radially) from other sampling probes (in the primary dilution tunnel) so as to be free from the influence of any wakes or eddies produced by the other probes.

(*2*) 0.5 in (1.3 cm) minimum inside diameter.

(*3*) No longer than 36 in (91 cm) from inlet plane to exit plane.

(*4*) Designed to minimize the deposition of particulate during transfer (*i.e.*, bends should be as gradual as possible, protrusions (due to sensors, *etc.*) should be smooth and not sudden, *etc.*).

(*5*) Constructed of electrically conductive material which does not react with the exhaust components, and electrically grounded.

(C) The secondary dilution air shall be at a temperature of 77°±9 °F (25°±5 °C). For the first 10 seconds this specification is 77°±20 °F (25°±11 °C).

(D) The secondary-dilution tunnel shall be:

(*1*) 3.0 inches (7.6 cm) minimum inside diameter.

(*2*) Of sufficient length so as to provide a residence time of at least 0.25 seconds for the double-diluted sample.

(*3*) Constructed of electrically conductive material which does not react with the exhaust components, and electrically grounded.

(E) Additional dilution air must be provided so as to maintain a sample temperature of 125 °F (51.7 °C) or less immediately before the primary sample filter.

(F) The primary filter holder shall be located within 12.0 in (30.5 cm) of the exit of the secondary dilution tunnel.

(G) Other sample flow handling and/or measurement systems may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(7) *Particulate sampling filters.* (i) Fluorocarbon-coated glass fiber filters or fluorocarbon-based (membrane) filters are required.

(ii) Particulate filters must have a minimum diameter of 70 mm (60 mm stain diameter). Larger diameter filters are acceptable.

(iii) The dilute exhaust will be simultaneously sampled by a pair of filters (one primary and one back-up filter) during the cold-start test and by a second pair of filters during the hot-start test. The back-up filter holder shall be located no more than 4 inches (10 cm) downstream of the primary filter holder. The primary and back-up filters shall not be in contact with each other.

(iv) The recommended minimum loading on a primary 70 mm filter is 5.3 milligrams. Equivalent loadings (*i.e.*, mass/stain area) are recommended for larger filters. For equivalency calculations assume the 70 mm filter has a 60 mm stain diameter.

(8) *Methanol sampling system.* The methanol sampling system, shown in Figure N90-2, consists of impingers (or sample collection capsules) containing known volumes of deionized water and sampling pump to draw the proportional sample through the impingers.

(9) *Formaldehyde sampling system.* The formaldehyde sampling system, Figure N90-3, consists of sample collection impingers and sampling pump to draw the proportional sample through the impingers.

[54 FR 14578, Apr. 11, 1989]

§ 86.1311-84 Exhaust gas analytical system; CVS bag sample.

(a) *Schematic drawings.* Figure N84-5 is a schematic drawing of the exhaust gas analytical system used for analyzing CVS bag samples from either gasoline- or diesel-fueled engines. Since various configurations can produce accurate results, exact conformance with the drawing is not required. Additional components such as instruments, valves, solenoids, pumps and switches may be used to provide additional information and coordinate the functions of the component systems. Other components such as snubbers, which are not needed to maintain accuracy in some systems, may be excluded if their exclusion is based upon good engineering judgment.

(b) *Major component description.* The analytical system, Figure N84-5, consists of a flame ionization detector (FID) for the measurement of hydrocarbons, nondispersive infrared analyzers (NDIR) for the measurement of carbon monoxide and carbon dioxide and a chemiluminescence analyzer (CL) for the measurement of oxides of nitrogen.

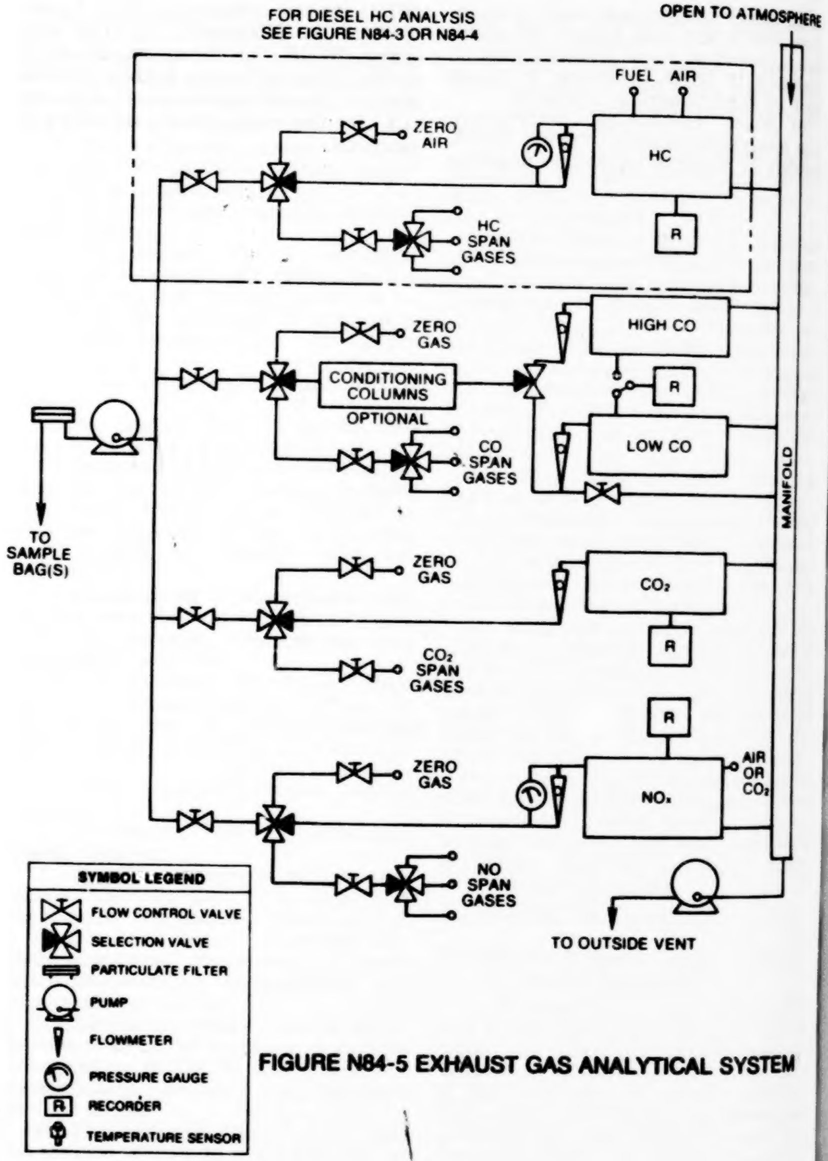

FOR DIESEL HC ANALYSIS
SEE FIGURE N84-3 OR N84-4
OPEN TO ATMOSPHERE
FUEL
AIR
ZERO AIR
HC
R
HC SPAN GASES
ZERO GAS
HIGH CO
CONDITIONING COLUMNS
OPTIONAL
R
LOW CO
CO SPAN GASES
MANIFOLD
TO SAMPLE BAG(S)
ZERO GAS
CO_2
R
CO_2 SPAN GASES
R
ZERO GAS
NO_x
AIR OR CO_2
NO SPAN GASES
TO OUTSIDE VENT
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
R
RECORDER
TEMPERATURE SENSOR

FIGURE N84-5 EXHAUST GAS ANALYTICAL SYSTEM

The exhaust gas analytical system shall conform to the following requirements:

(1) The CL requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(2) The carbon monoxide (NDIR) analyzer may require a sample conditioning column containing $CaSO_4$ or dessicating silica gel to remove water vapor, and containing ascarite to remove carbon dioxide from the CO analysis stream.

(i) If CO instruments are used which are essentially free of CO_2 and water vapor interference, the use of the conditioning column may be deleted. (See §§ 86.1322-84 and 86.1342-84.)

(ii) A CO instrument will be considered to be essentially free of CO_2 and water vapor interference if its response to a mixture of 3 percent CO_2 in N_2 which has been bubbled through water at room temperature produces an equivalent CO response, as measured on the most sensitive CO range, which is less than 1 percent of full scale CO concentration on ranges above 300 ppm full scale or less than 3 ppm on ranges below 300 ppm full scale. (See § 86.1322-84.)

(c) *Alternate analytical systems.* Analysis systems meeting the specifications of 40 CFR Part 86 Subpart D may be used for testing required under this subpart, with the exception of §§ 86.346-79 and 86.347-79, provided that the Subpart D systems meet the specifications of this subpart. Heated analyzers may be used in their heated configuration.

(d) *Other analyzers and equipment.* Other types of analyzers and equipment may be used if shown to yield equivalent results and if approved in advance by the Administrator.

§ 86.1311-90 Exhaust gas analytical system; CVS bag sample.

(a) *Schematic drawings.* Figure N90-9 is a schematic drawing of the exhaust gas analytical system used for analyzing CVS bag samples from either Otto-cycle or diesel engines. Since various configurations can produce accurate results, exact conformance with the drawing is not required. Additional components such as instruments, valves, solenoids, pumps and switches may be used to provide additional information and coordinate the functions of the component systems. Other components such as snubbers, which are not needed to maintain accuracy in some systems, may be excluded if their exclusion is based upon good engineering judgment.

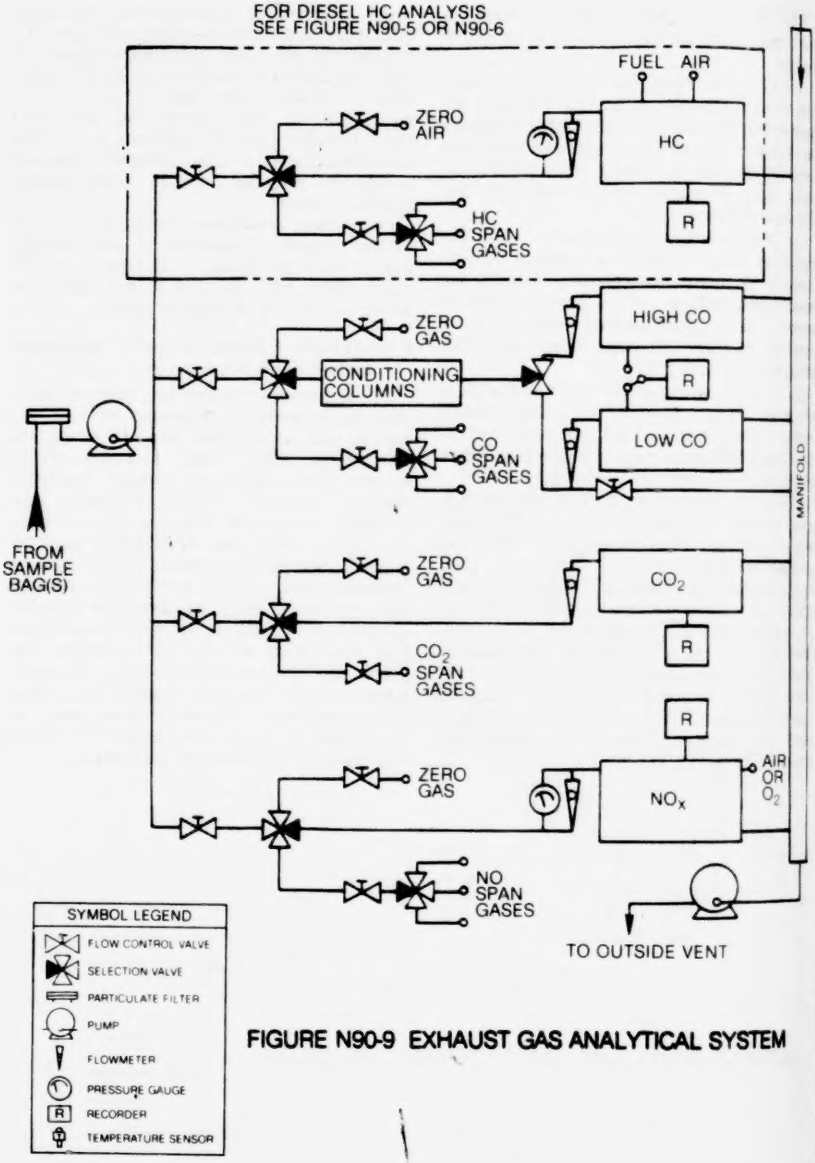

FOR DIESEL HC ANALYSIS
SEE FIGURE N90-5 OR N90-6
FUEL
AIR
ZERO AIR
HC
R
HC SPAN GASES
ZERO GAS
HIGH CO
CONDITIONING COLUMNS
R
LOW CO
CO SPAN GASES
FROM SAMPLE BAG(S)
MANIFOLD
ZERO GAS
CO2
R
CO2 SPAN GASES
R
ZERO GAS
NOx
AIR OR O2
NO SPAN GASES
TO OUTSIDE VENT
SYMBOL LEGEND
FLOW CONTROL VALVE
SELECTION VALVE
PARTICULATE FILTER
PUMP
FLOWMETER
PRESSURE GAUGE
R
RECORDER
TEMPERATURE SENSOR

FIGURE N90-9 EXHAUST GAS ANALYTICAL SYSTEM

(b) *Major component description.* The analytical system, Figure N90–9, consists of a flame ionization detector (FID) (heated for methanol-fueled (235±15 °F (113±8 °C)) and for petroleum-fueled diesel (375 °±10 °F (191 °±6 °C) engines) for the measurement of hydrocarbons, nondispersive infrared analyzers (NDIR) for the measurement of carbon monoxide and carbon dioxide, and a chemiluminescence analyzer (CL) for the measurement of oxides of nitrogen. The analytical system for methanol consists of a gas chromatograph (GC), equipped with a flame ionization detector. The analysis for formaldehyde is performed using high pressure liquid chromatography (HPLC) of 2,4-dinitrophenylhydrazine (DNPH) derivatives using ultraviolet (UV) detection. The exhaust gas analytical system shall conform to the following requirements:

(1) The CL requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(2) The carbon monoxide (NDIR) analyzer may require a sample conditioning column containing $CaSO_4$, or dessicating silica gel to remove water vapor, and containing ascarite to remove carbon dioxide from the CO analysis stream.

(i) If CO instruments are used which are essentially free of CO_2 and water vapor interference, the use of the conditioning column may be deleted. (*See* §§ 86.1322 and 86.1342.)

(ii) A CO instrument will be considered to be essentially free of CO_2 and water vapor interference if its response to a mixture of 3 percent CO_2 in N_2, which has been bubbled through water at room temperature, produces an equivalent CO response, as measured on the most sensitive CO range, which is less than 1 percent of full scale CO concentration on ranges above 300 ppm full scale or less than 3 ppm on ranges below 300 ppm full scale. (*See* § 86.1322.)

(c) *Alternate analytical systems.* Analysis systems meeting the specifications of 40 CFR Part 86 Subpart D may be used for testing required under this subpart, with the exception of §§ 86.346 and 86.347, provided that the Subpart D systems meet the specifications of this subpart. Heated analyzers may be used in their heated configuration.

(d) *Other analyzers and equipment.* Other types of analyzers and equipment may be used if shown to yield equivalent results and if approved in advance by the Administrator.

[54 FR 14578, Apr. 11, 1989]

§ 86.1312–88 Weighing chamber and microgram balance specifications.

(a) *Ambient conditions.* (1) *Temperature.* The temperature of the chamber (or room) in which the particulate filters are conditioned and weighed shall be maintained to within ±10° F (±6° C) of a set point between 68° F (20° C) and 86° F (30° C) during all filter conditioning and weighing.

(2) *Humidity.* The relative humidity of the chamber (or room) in which the particulate filters are conditioned and weighed shall be maintained to within ±10 percent (relative humidity) of a set point between 30 and 70 percent during all filter conditioning and weighing.

(3) The chamber (or room) environment shall be free of any ambient contaminates (such as dust) that would settle on the particulate filters during their stabilization. It is required that at least two unused reference filters remain in the weighing room at all times in covered (to reduce dust contamination) but unsealed (to permit humidity exchange) petri dishes. These reference filters shall be placed in the same general area as the sample filters. These reference filters shall be weighed within 4 hours of, but preferably at the same time as, the sample filter weighings.

(4) If the average weight of the reference filters changes between sample filter weighings by ±5.0 percent or more of the nominal filter loading (a recommended minimum of 5.3 milligrams), then all sample filters in the process of stabilization shall be discarded and the emissions tests repeated.

(5) If the average weight of the reference filters changes between sample

filter weighings by more than −1.0 percent but less than −5.0 percent of the nominal filter loading (a weight loss) then the manufacturer has the option of either repeating the emissions test or adding the average amount of weight loss to the net weight of the sample.

(6) If the average weight of the reference filters changes between sample filter weighing by more than 1.0 percent but less than 5.0 percent of the nominal filter loading (a weight gain), then the manufacturer has the option of either repeating the emissions test or accepting the measured sample filter weight values.

(7) If the average weight of the reference filters changes between sample filter weighings by not more than ±1.0 percent, then the measured sample filter weights shall be used.

(8) The reference filters shall be changed at least once a month, but never between clean and used weighings of a given sample filter. More than one set of reference filters may be used. The reference filters shall be the same size and material as the sample filters.

(b) *Weighing balance specifications.* The microgram balance used to determine the weights of all filters shall have a precision (standard deviation) of 20 micrograms and readability of 10 micrograms.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10702, Mar. 15, 1985, as amended at 52 FR 47871, Dec. 16, 1987]

§ 86.1313-84 Fuel specifications.

(a) *Gasoline.* (1) Gasoline having the specifications listed in Table N84-1 will be used by the Administrator in exhaust emission testing. Gasoline having these specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust emission testing, except that the lead and octane specifications do not apply.

TABLE N84-1

Item	ASTM	Leaded	Unleaded
Octane, research, minimum.	D2699	98	[illegible]
Sensitivity (minimum)		7.5	7.5
Pb (organic), gm/U.S. gallon.		[1] 1.4	[illegible]
Distillation range:			
IBP, °F	D86	75-95	75-95
10 percent point, °F	D86	120-135	120-135
50 percent point, °F	D86	200-230	200-230
90 percent point, °F	D86	300-325	300-325
EP, °F (maximum)	D86	415	415
Sulphur, weight percent, (max).	D1266	0.10	0.10
Phosphorus, gm/U.S. gallon (max).		0.01	0.005
RVP, psi	D323	8.7-9.2	8.7-9.2
Hydrocarbon composition:			
Olefins, percent, (max).	D1319	10	[illegible]
Aromatics, percent (max).	D1319	35	[illegible]
Saturates	D1319	([2])	[illegible]

[1] Minimum.

[2] Remainder.

(2) Gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation.

(i) For leaded fuel the minimum lead content shall be equal to the average lead content found in regular leaded gasoline in the fuel survey prescribed by the Administrator.

(ii) Where the Administrator determines that vehicles represented by a test vehicle will be operated using gasoline of different lead content than that prescribed in this paragraph, he may consent in writing to use of a gasoline with a different lead content.

(iii) The octane rating of the gasoline used shall be not higher tnan one octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers for unleaded fuel and 7.0 octane numbers for leaded fuel where sensitivity is defined as the research octane number minus the Motor octane number.

(iv) The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(3) The specification range of the gasoline to be used under paragraph

(a)(2) of this section shall be reported in accordance with § 86.084-21(b)(3).

(b) *Diesel fuel.* (1) The diesel fuels employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, and dispersant.

(2) Diesel fuel meeting the specifications in Table N84-2, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emissions testing. The grade of diesel fuel recommended by the engine manufacturer commercially designated as "Type 1-D" or "Type 2-D" grade diesel fuel shall be used.

TABLE N84-2

Item	ASTM	Type 1-D	Type 2-D
Cetane	D613	48-54	42-50
Distillation range:			
IBP °F	D86	330-390	340-400
10 percent point, °F	D86	370-430	400-460
50 percent point, °F	D86	410-480	470-540
90 percent point, °F	D86	460-520	550-610
EP, °F	D86	500-560	580-660
Gravity, API	D287	40-44	33-37
Total Sulfur, percent	D129 or D2622.	0.05-0.20	0.2-0.5
Hydrocarbon composition:			
Aromatics, percent	D1319	[1]8	[1]27
Paraffins, Naphthenes, Olefins.	D1319	(2)	(2)
Flashpoint, °F (minimum).	D93	120	130
Viscosity, Centistokes	D445	1.6-2.0	2.0-3.2

[1] Minimum.

[2] Remainder.

(3) Diesel fuel meeting the specifications in Table N84-3, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as "Type 1-D" or "Type 2-D" grade diesel fuel shall be used:

TABLE N84-3

Item	ASTM	Type 1-D	Type 2-D
Cetane	D613	42-56	30-58
Distillation range:			
90 percent point, °F	D86	440-530	540-630
Gravity API	D287	39-45	30-42
Total sulfur, percent (minimum).	D129 or D2622.	0.05	0.2
Flashpoint, °F (minimum).	D93	120	130
Viscosity, centistokes	D455	1.2-2.2	1.5-4.5

(4) Other petroleum distillate fuels may be used for testing and service accumulation provided that:

(i) They are commercially available;

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service;

(iii) Use of a fuel listed under paragraphs (b)(2) and (b)(3) of this section would have a detrimental effect on emissions or durability;

(iv) Written approval from the Administrator of the fuel specifications is provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (b)(2), (b)(3), and (b)(4) of this section shall be reported in accordance with § 86.084-21(b)(3).

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48144, Dec. 10, 1984]

§ 86.1313-87 Fuel specifications.

(a) *Gasoline.* (1) Gasoline having the specifications listed in Table N87-1 will be used by the Administrator in exhaust emission testing. Gasoline having these specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust emission testing, except that the lead and octane specifications do not apply.

TABLE N87-1

Item	ASTM	Leaded	Unleaded
Octane, research, min.	D2699	98	93
Sensitivity, (min.)		7.5	7.5

TABLE N87-1—Continued

Item	ASTM	Leaded	Unleaded
Pb (organic), gm/U.S. gal. (g/liter)	D3237	[1] 0.100 [1] 0.026	[1] 0.05 [1] 0.013
Distillation range:			
IBP, °F (°C)	D86	75-95 (23.9-35)	75-9 (23.9-35
10 percent point, °F (°C)	D86	120-135 (48.9-57.2)	120-13 (48.9-57.2
50 percent point, °F (°C)	D86	200-230 (93.3-110)	200-23 (93.3-110
90 percent point, °F (°C)	D86	300-325 (148.9-162.8)	300-32 (148.9-162.8
EP, °F, (maximum) (°C)	D86	415 (212.8)	41 (212.8
Sulphur, wt. pct. (max.)	D1266	0.10	0.1
Phosphorus, gm/U.S. gal. (g/liter) max		0.01 (0.0026)	0.00 (0.0026
RVP, psi	D323	8.0-9.2	8.0-9.2
Hydrocarbon composition:			
Olefins, pct., max	D1319	10	1
Aeromatics, pct., max	D1319	35	3
Saturates	D1319	([2])	(

[1] Maximum.
[2] Remainder.

(2) Gasoline representative of commercial gasoline which is generally available through retail outlets shall be used in service accumulation.

(i) For leaded fuel the lead content shall not exceed 0.100 gram lead per gallon leaded gasoline.

(ii) Where the Administrator determines that vehicles represented by a test vehicle will be operated using gasoline of different lead content than that prescribed in this paragraph, he may consent in writing to use of gasoline with a different lead content.

(iii) The octane rating of the gasoline used shall be not higher than one research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers for unleaded fuel and 7.0 octane numbers for leaded fuel, where sensitivity is defined as the Research octane number minus the Motor octane number.

(iv) The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(3) The specification range of the gasoline to be used under paragraph (a) (2) of this section shall be reported in accordance with § 86.084-21(b) (3).

(b) *Diesel fuel.* (1) The diesel fuel employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, and dispersant.

(2) Diesel fuel meeting the specifications in Table N87-2, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emissions testing. The grade of diesel fuel recommended by the engine manufacturer commercially designated as "Type 1-D" or "Type 2-D" grade diesel fuel shall be used.

TABLE N87-2

Item	ASTM	Type 1-D	Type 2-D
Cetane	D613	48-54	42-5
Distillation range:			
IBP, °F	D86	330-390	340-40
(°C)		(165.6-198.9)	(171.1-204.4
10 pct. point, °F.	D86	370-430	400-46
(°C)		(187.8-221.1)	(204.4-237.8
50 pct. point, °F.	D86	410-480	470-54
(°C)		(210-248.9)	(243.3-282.2
90 pct. point, °F.	D86	460-520	550-61
°C		*237.8-271.1)	(287.8-321.1
EP, °F	D86	500-560	580-66
°C		(260.0-293.3)	(304.4-3
Gravity, °API	D287	40-44	33-37

TABLE N87-2—Continued

Item	ASTM	Type 1-D	Type 2-D
Total sulfur, pct	D129 or D2622.	0.05–0.20	0.20–0.50
Hydrocarbon composition:			
Aromatics, pct	D1319	8	27
Parafins, naphthenes, olefines.	D1319	(2)	(2)
Flashpoint, ° F (min.).	D93	120	130
(° C		(48.9)	(54.4)
Viscosity, centistokes.	D445	1.6–2.0	2.0–3.2

[1] Minimum.
[2] Remainder.

(3) Diesel fuel meeting the specifications in Table N87-3, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as "Type 1-D" or "Type 2-D" grade diesel fuel shall be used:

TABLE N87-3

Item	ASTM	Type 1-D	Type 2-D
Cetane	D613	42–56	30–58
Distillation range:			
90 pct. point, ° F.	D86	440–530	540–630
(° C)		(226.7–276.7)	(282.2–332.2)
Gravity, ° API	D287	39–45	30–42
Total sulfur, pct., min.	D129 or D2622.	0.05	0.20
Flashpoint, ° F, min.	D93	120	130
(° C)		(48.9)	(54.4)
Viscosity, centistokes.	D455	1.2–2.2	1.5–4.5

(4) Other petroleum distillate fuels may be used for testing and service accumulation provided that:

(i) They are commercially avialable;

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service;

(iii) Use of a fuel listed under paragraphs (b)(2) and (b)(3) of this section would have a detrimental effect on emissions or durability;

(iv) Written approval from the Administrator of the fuel specifications is provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (b)(2), (3) and (4) of this section shall be reported in accordance with § 86.085-21(b)(3).

[51 FR 24612, July 7, 1986, as amended at 52 FR 47871, Dec. 16, 1987]

§ 86.1313-90 Fuel specifications.

(a) *Otto-cycle test fuel.* (1) Gasoline having the specifications listed in Table N90-1 will be used by the Administrator in exhaust emission testing petroleum-fueled Otto-cycle engines. Gasoline having these specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust emission testing, except that the octane specification does not apply.

TABLE N90-1

Item	ASTM	Value
Octane, research, min	D2699	93
Sensitivity, min		7.5
Lead (organic), g/U.S. gal	D3237	[1] (0.050)
(g/liter)		[1] (0.013)
Distillation range:		
IBP, °F	D86	75–95
(°C)		(23.9–35)
10 pct. point, °F	D86	120–135
(°C)		(48.9–57.2)
50 pct. point, °F	D86	200–230
(°C)		(93.3–110)
90 pct. point, °F	D86	300–325
(°C)		(148.9–162.8)
EP, max. °F	D86	415
(°C)		(212.8)
Sulphur, max. wt. pct	D1266	0.10
Phosphorus, max., g/U.S. gal		0.005
(g/liter)	D3231	(0.0013)
RVP, psi	D323	8.0–9.2
(kPa)		(60.0–63.4)
Hydrocarbon composition:		
Olefins, max. pct	D1319	10
Aeromatics, max. pct	D1319	35
Saturates	D1319	[2]

[1] Maximum.
[2] Remainder.

(2) Unleaded gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation.

(i) The octane rating of the gasoline used shall be not higher than one Research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers, where sensitivity is defined as the Research octane number minus the Motor octane number.

(ii) The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(3) Methanol fuel used for exhaust and evaporative emission testing and in service accumulation of methanol-fueled Otto-cycle engines shall be representative of commercially available methanol fuel and shall consist of at least 50 percent methanol by volume.

(i) Manufacturers shall recommend the methanol fuel to be used for testing and service accumulation in accordance with paragraph (a)(3) of this section.

(ii) The Administrator shall determine the methanol fuel to be used for testing and service accumulation.

(4) Other methanol fuels may be used for testing and service accumulation provided:

(i) They are commercially available, and

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(iii) Use of a fuel listed under paragraph (a)(3) of this section would have a detrimental effect on emissions or durability, and

(iv) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (a)(2), (a)(3), and (a)(4) of this section shall be reported in accordance with § 86.090-21(b)(3).

(b) *Diesel test fuel.* (1) The petroleum fuels for testing diesel engines employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The petroleum fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, dispersant, and biocide.

(2) Petroleum fuel for diesel engines meeting the specifications in Table N90-2, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emissions testing. The grade of petroleum fuel recommended by the engine manufacturer commercially designated as "Type 1-D" or "Type 2-D" grade diesel fuel shall be used.

TABLE N90-2

Item	ASTM	Type 1-D	Type 2-D
Cetane	D613	48-54	42-5
Distillation range:			
IBP, °F	D86	330-390	340-40
(°C)		(165.6-198.9)	(171.1-204.4
10 pct. point, °F	D86	370-430	400-46
(°C)		(187.8-221.1)	(204.4-237.8
50 pct. point, °F	D86	410-480	470-54
(°C)		(210-248.9)	(243.3-282.2
90 pct. point, °F	D86	460-520	550-61
(°C)		(237.8-271 1)	(287.8-321.1
EP, °F	D86	500-560	580-6
(°C)		(260.0-293.3)	(304.4-34
Gravity, °API	D287	40-44	33-37
Total sulfur, pct.	D129 or D2622	0.05-0.20	0.20-0.5
Hydrocarbon composition:			
Aromatics, pct.	D1319	[1] 8	[1] 27
Paraffins, Naphthenes, Olefins	D1319	([2])	(
Flashpoint, min., °F,	D93	120	13
(°C)		(48.9)	(54.4
Viscosity, centistokes	D445	1.6-2.0	2.0-3.2

[1] Minimum.
[2] Remainder.

(3) Petroleum fuel for diesel engines meeting the specifications in Table N90-3, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of petroleum diesel fuel recommended by the engine manufacturer, commercially designated as "Type 1-D" or "Type 2-D" grade diesel fuel shall be used:

TABLE N90-3

Item	ASTM	Type 1-D	Type 2-D
Cetane	D613	42–56	30–58
Distillation range:			
90 pct. point, °F	D86	440–530	540–630
(°C)		(226.7–276.7)	(282.2–332.2)
Gravity, °API	287	39–45	30–42
Total sulfur, min., pct	D129 or D2622	0.05	0.20
Flashpoint, min., °F,	D93	120	130
(°C)		(48.9)	(54.4)
Viscosity, centistokes	D455	1.2–2.2	1.5–4.5

(4) Methanol fuel used for exhaust and evaporative emission testing and in service accumulation of methanol-fueled diesel engines shall be representative of commercially available methanol fuel and shall consist of at least 50 percent methanol by volume.

(i) Manufacturers shall recommend the methanol fuel to be used for testing and service accumulation in accordance with paragraph (b)(4) of this section.

(ii) The Administrator shall determine the methanol fuel to be used for testing and service accumulation.

(5) Other fuels may be used for testing and service accumulation provided:

(i) They are commercially available, and

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(iii) Use of a fuel listed under paragraphs (b)(2) and (b)(3) or (b)(4) of this section would have a detrimental effect on emissions or durability, and

(iv) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(6) The specification range of the fuels to be used under paragraphs (b)(2), (b)(3), (b)(4), and (b)(5) of this section shall be reported in accordance with § 86.090-21(b)(3).

(c) Fuels not meeting the specifications set forth in this section may be used only with the advance approval of the Administrator.

(d) *Mixtures of petroleum and methanol fuels for flexible fuel vehicles.* (1) Mixtures of petroleum and methanol fuels used for exhaust and evaporative emission testing and service accumulation for flexible fuel vehicles shall be within the range of fuel mixtures for which the vehicle was designed.

(2) Manufacturer testing and service accumulation may be performed using only those mixtures (mixtures may be different for exhaust testing, evaporative testing, and service accumulation) expected to result in the highest emissions, provided:

(i) The fuels which constitute the mixture will be used in customer service, and

(ii) Information, acceptable to the Administrator, is provided by the manufacturer to show that the designated fuel mixtures would result in the highest emissions, and

(iii) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(3) The specification range of the fuels to be used under paragraph (d)(2) of this section shall be reported in accordance with § 86.090-21(b)(3).

[54 FR 14589, Apr. 11, 1989]

§ 86.1314-84 Analytical gases.

(a) Gases for the CO and CO_2 analyzers shall be single blends of CO and CO_2, respectively, using nitrogen as the diluent.

(b) Gases for the hydrocarbon analyzer shall be single blends of propane using air as the diluent.

(c) Gases for the NO_x analyzer shall be single blends of NO named as NO_x with a maximum NO_2 concentration of 5 percent of the nominal value using nitrogen as the diluent.

(d) Fuel for the FID shall be a blend of 40±2 percent hydrogen with the balance being helium. The mixture shall contain less than 1 ppm equivalent carbon response; 98 to 100 percent hydrogen fuel may be used with advance approval of the Administrator.

(e) The allowable zero gas (air or nitrogen) impurity concentrations shall not exceed 1 ppm equivalent carbon response, 1 ppm carbon monoxide, 0.04 percent (400 ppm) carbon dioxide and 0.1 ppm nitric oxide.

(f)(1) "Zero-grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

(2) Calibration gases shall be accurate to within ±1 percent of NBS gas standards, or other gas standards which have been approved by the Administrator.

(3) Span gases shall be accurate to within ±2 percent of NBS gas standards, or other gas standards which have been approved by the Administrator.

(g) The use of precision blending devices (gas dividers) to obtain the required calibration gas concentrations is acceptable, provided that the blended gases are accurate to within ±1.5 percent of NBS gas standards, or other gas standards which have been approved by the Administrator. This accuracy implies that primary gases used for blending must be "named" to an accuracy of at least ±1 percent, traceable to NBS or other approved gas standards.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48144, Dec. 10, 1984]

§ 86.1316-84 Calibrations; frequency and overview.

(a) Calibrations shall be performed as specified in §§ 86.1318-84 through 86.1326-84.

(b) At least monthly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Calibrate the hydrocarbon analyzer, carbon dioxide analyzer, carbon monoxide analyzer, and oxides of nitrogen analyzer.

(2) Calibrate the engine dynamometer flywheel torque and speed measurement transducers, and calculate the feedback signals to the cycle verification equipment.

(c) At least weekly or after any maintenance which could alter calibration, the following checks shall be performed:

(1) Check the oxides of nitrogen converter efficiency,

(2) Perform a CVS system verification

(3) Check the shaft torque feedback signal at steady-state conditions by comparing:

(i) Shaft torque feedback to dynamometer beam load, or

(ii) By comparing in-line torque to armature current, or

(iii) By checking the in-line torque meter with a dead weight per § 86.1308-84(e).

(d) The CVS positive displacement pump or critical flow venturi shall be calibrated following initial installation, major maintenance or as necessary when indicated by the CVS system verification (described in § 86.1319-84).

(e) Sample conditioning columns, if used in the CO analyzer train, should be checked at a frequency consistent with observed column life or when the indicator of the column packing begins to show deterioration.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48144, Dec. 10, 1984]

§ 86.1316-90 Calibrations; frequency and overview.

(a) Calibrations shall be performed as specified in §§ 86.1318 through 86.1326.

(b) At least monthly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Calibrate the hydrocarbon analyzer, carbon dioxide analyzer, carbon monoxide analyzer, oxides of nitrogen analyzer, methanol analyzer and formaldehyde analyzer (certain analyzers may require more frequent calibration depending on the equipment and use).

(2) Calibrate the engine dynamometer flywheel torque and speed measurement transducers, and calculate the feedback signals to the cycle verification equipment.

(c) At least weekly or after any maintenance which could alter calibration, the following checks shall be performed:

(1) Check the oxides of nitrogen converter efficiency, and;

(2) Perform a CVS system verification.

(3) Check the shaft torque feedback signal at steady-state conditions by comparing:

(i) Shaft torque feedback to dynamometer beam load, or

(ii) By comparing in-line torque to armature current, or

(iii) By checking the in-line torque meter with a dead weight per § 86.1308(e).

(d) The CVS positive displacement pump or critical flow venturi shall be calibrated following initial installation, major maintenance or as necessary when indicated by the CVS system verification (described in § 86.1319).

(e) Sample conditioning columns, if used in the CO analyzer train, should be checked at a frequency consistent with observed column life or when the indicator of the column packing begins to show deterioration.

[54 FR 14591, Apr. 11, 1989]

§ 86.1318-84 Engine dynamometer system calibrations.

(a) The engine flywheel torque and engine speed measurement transducers shall be calibrated at least once each month with the calibration equipment described in § 86.1308-84.

(b) The engine flywheel torque feedback signals to the cycle verification equipment shall be electronically checked before each test, and adjusted as necessary.

(c) Other engine dynamometer system calibrations shall be performed as dictated by good engineering practice.

(d) When calibrating the engine flywheel torque transducer, any lever arm used to convert a weight or a force through a distance into a torque shall be used in a horizontal position (±5 degrees).

(e) Calibrated resistors may not be used for engine flywheel torque transducer calibration, but may be used to span the transducer prior to engine testing.

§ 86.1319-84 CVS calibration.

(a) The CVS is calibrated using an accurate flowmeter and restrictor valve. The flowmeter calibration shall be traceable to the NBS, and will serve as the reference value (NBS "true" value) for the CVS calibration. (Note: In no case should an upstream screen or other restriction which can affect the flow be used ahead of the flowmeter unless calibrated throughout the flow range with such a device.) The CVS calibration procedures are designed for use of a "metering venturi" type flowmeter. Large radius or ASME flow nozzles are considered equivalent if traceable to NBS measurements. Other measurement systems may be used if shown to be equivalent under the test conditions in this action and traceable to NBS measurements. Measurements of the various flowmeter parameters are recorded and related to flow through the CVS. Procedures used by EPA for both PDP- and CFV-CVS's are outlined below. Other procedures yielding equivalent results may be used if approved in advance by the Administrator.

(b) After the calibration curve has been obtained, verification of the entire system may be performed by injecting a known mass of gas into the system and comparing the mass indicated by the system to the true mass injected. An indicated error does not necessarily mean that the calibration is wrong, since other factors can influence the accuracy of the system (e.g., analyzer calibration, leaks, or HC hangup). A verification procedure is found in paragraph (e) of this section.

(c) *PDP calibration.* (1) The following calibration procedure outlines the equipment, the test configuration, and the various parameters which must be measured to establish the flow rate of the CVS pump.

(i) All the parameters related to the pump are simultaneously measured with the parameters related to a flowmeter which is connected in series with the pump.

(ii) The calculated flow rate, ft^3/min. (at a pump inlet absolute pressure and temperature), can then be plotted versus a correlation function which is the value of a specific combination of pump parameters.

(iii) The linear equation which relates the pump flow and the correlation function is then determined.

(iv) In the event that a CVS has a multiple speed drive, a calibration for each range used must be performed.

(2) This calibration procedure is based on the measurement of the absolute values of the pump and flowm ter parameters that relate the flo rate at each point. Two conditio must be maintained to assure the a curacy and integrity of the calibratio curve:

(i) The temperature stability mu be maintained during calibratio (Flowmeters are sensitive to inlet tem perature oscillations; this can caus the data points to be scattered. Grad al changes in temperature are accepta ble as long as they occur over a perio of several minutes.)

(ii) All connections and ducting be tween the flowmeter and the CV pump must be absolutely void of leak age.

(3) During an exhaust emission tes the measurement of these same pum parameters enables the user to calcu late the flow rate from the calibratio equation.

(4) Connect a system as shown i Figure N84-6. Although particula types of equipment are shown, othe configurations that yield equivalen results may be used if approved in ad vance by the Administrator. For th system indicated, the following mea urements and accuracies are required

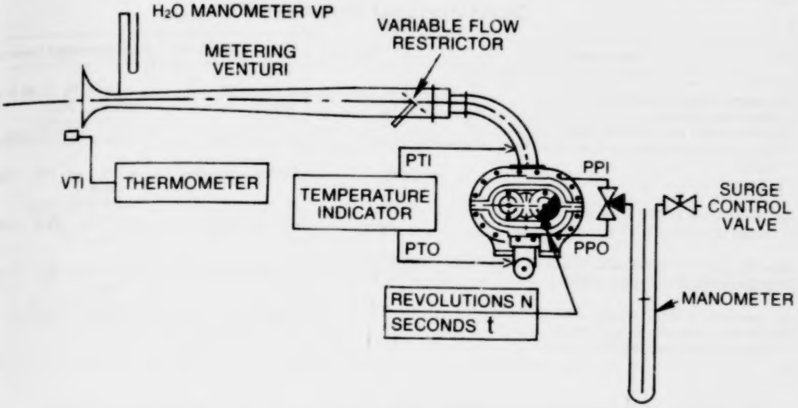

H2O MANOMETER VP
METERING VENTURI
VARIABLE FLOW RESTRICTOR
VTI
THERMOMETER
PTI
TEMPERATURE INDICATOR
PTO
PPI
PPO
SURGE CONTROL VALVE
REVOLUTIONS N
SECONDS t
MANOMETER

FIGURE N84-6 — PDP-CVS CALIBRATION CONFIGURATION

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Sensor-readout toleranc
Barometric pressure (corrected)	P_B	In. Hg (kPa)	±.10 in. Hg (±.340 k
Ambient temperature	T_A	°F (°C)	±.5°F (±.28°C).
Air temperature into metering venturi	ETI	°F (°C)	±2.0°F (±1.11°C).
Pressure drop between the inlet and throat of metering venturi.	EDP	In. H2O (kPa)	±.05 in. H_2O (±.012 k
Air flow	Q_s	Ft³/min. (m³/min.)	±.5% of NBS "t value.
Air temperature at CVS pump inlet	PTI	°F (°C)	±2.0 °F (±1.11°C).
Pressure depression at CVS pump inlet	PPI	In. Fluid (kPa)	±.13 in. Fluid (±.0 kPa).
Specific gravity of manometer fluid (1.75 oil)	Sp. G.		
Pressure head at CVS pump outlet	PPO	In. Fluid (kPa)	±.13 in. Fluid (±.0 kPa).
Air temperature at CVS pump outlet (optional)	PTO	°F (°C)	±2.0°F (±1.11°C).
Pump revolutions during test period	N	Revs	±1 Rev.
Elapsed time for test period	t	s	±.5 s.

(5) After the system has been connected as shown in Figure N84-6, set the variable restrictor in the wide open position and run the CVS pump for 20 minutes. Record the calibration data.

(6) Reset the restrictor valve to a more restricted condition in an increment of pump inlet depression that will yield a minimum of six data points for the total calibration. Allow the system to stabilize for 3 minutes and repeat the data acquisition.

(7) *Data analysis:* (i) The air flow rate, Q_s, at each test point is calculated in standard cubic feet per minute (68° F, 29.92″Hg) from the flowmeter data using the manufacturer's prescribed method.

(ii) The air flow rate is then converted to pump flow, V_o, in cubic feet per revolution at absolute pump inlet temperature and pressure:

$$V_o = \frac{Q_s}{n} \times \frac{T_p}{528} \times \frac{29.92}{P_p}$$

Where:

V_o=Pump flow, ft³/revolution (m³/revolution) at T_p, P_p

Q_s=Meter air flow rate in standard cubic feet per minute, standard conditions are 68°F, 29.92 inches Hg (20°C, 101.3 kPa)

n=Pump speed in revolutions per minute

T_p=Pump inlet temperature °R(°K)
=PTI+460 (°R), or
=PTI+273 (°K)

P_p=Absolute pump inlet pressure, inches Hg (kPa)
=P_B−PPI (Sp. Gr./13.5955) and
=P_B−PPI for SI units

Where:

P_B=barometric pressure, inches Hg (kPa)

PPI=Pump inlet depression, inches fluid (kPa)

Sp. Gr.=Specific gravity of manometer fluid

(iii) The correlation function at each test point is then calculated from the calibration data.

$$X_o = \frac{1}{n}\sqrt{\frac{\Delta P}{P_e}}$$

Where:

X_o = correlation function.

ΔP = The pressure differential from pump inlet to pump outlet, inches Hg (kPa).

$= P_e - P_p$

P_e = Absolute pump outlet pressure, inches Hg (kPa)

$= P_B + PPO\ (Sp.\ Gr./13.5955)$ and

$= P_B + PPO$ for SI units

Where:

PPO = Pressure head at pump outlet, inches fluid (kPa).

(iv) A linear least squares fit is performed to generate the calibration equation which has the form:

$V_o = D_o - M(X_o)$

D_o and M are the intercept and slope constants, respectively, describing the regression lines.

(8) A CVS system that has multiple speeds should be calibrated on each speed used. The calibration curves generated for the ranges will be approximately parallel and the intercept values, D_o, will increase as the pump flow range decreases.

(9) If the calibration has been performed carefully, the calculated values from the equation will be within ±0.50 percent of the measured value of V_o. Values of M will vary from one pump to another, but values of D_o for pumps of the same make, model and range should agree within ±3 percent of each other. Particulate influx over time will cause the pump slip to decrease, as reflected by lower values for M. Calibrations should be performed at pump start-up and after major maintenance to assure the stability of the pump slip rate. Analysis of mass injection data will also reflect pump slip stability.

(d) *CFV calibration.* (1) Calibration of the CFV is based upon the flow equation for a critical venturi. Gas flow is a function of inlet pressure and temperature:

$$Q_s = \frac{K_v P}{\sqrt{T}}$$

The calibration procedure described in paragraph (d)(3) of this section establishes the value of the calibration coefficient at measured values of pressure, temperature and air flow.

(2) The manufacturer's recommended procedure shall be followed for calibrating electronic portions of the CFV.

(3) Measurements necessary for flow calibration are as follows:

CALIBRATION DATA MEASUREMENTS

Parameter	Sym	Units	Tolerances
Barometric Pressure (corrected)	P_B	in. Hg (kPa)	±.10 in. Hg (±.34 kPa).
Air temperature, into flowmeter	ETI	°F (°C)	±.5°F (±.28°C).
Pressure drop between the inlet and throat of metering venturi.	EDP	in. H_2O (kPa)	±.05 in. H_2O (±.012 kPa).
Air flow	Q_s	ft³/min. (m³/min.)	±.5% of NBS "true" value
CFV inlet depression	PPI	in. fluid (kPa)	±.13 in. fluid (±.055 kPa
Temperature at venturi inlet	T_v	°F (°C)	±4.0°F (±2.22°C).
Specific gravity of manometer fluid (1.75 oil)	Sp. Gr		

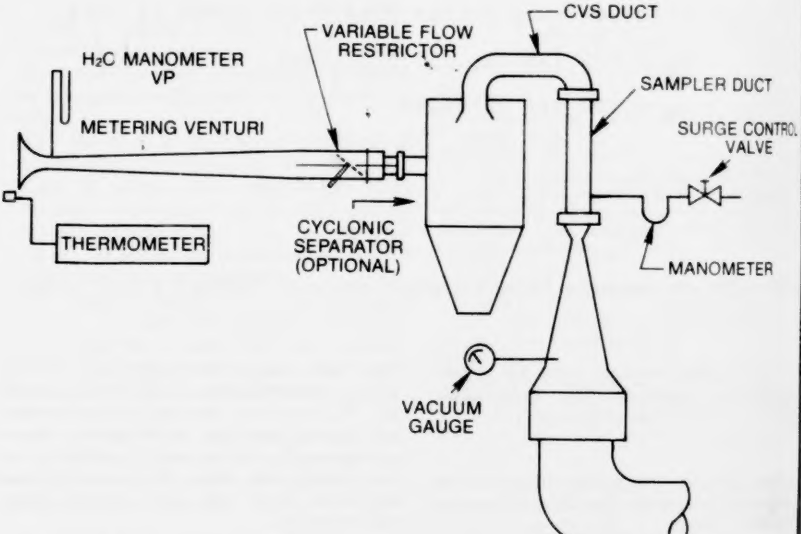

CVS DUCT
VARIABLE FLOW RESTRICTOR
H2C MANOMETER VP
SAMPLER DUCT
METERING VENTURI
SURGE CONTROL VALVE
THERMOMETER
CYCLONIC SEPARATOR (OPTIONAL)
MANOMETER
VACUUM GAUGE

FIGURE N84-7 — CFV-CVS CALIBRATION CONFIGURATION

(4) Set up equipment as shown in Figure N84-7 and eliminate leaks. (Leaks between the flow measuring devices and the critical flow venturi will seriously affect the accuracy of the calibration.)

(5) Set the variable flow restrictor to the open position, start the blower, and allow the system to stabilize. Record data from all instruments.

(6) Vary the flow restrictor and make at least eight readings across the critical flow range of the venturi.

(7) *Data analysis.* The data recorded during the calibration are to be used in the following calculations:

(i) The air flow rate, Qs, at each test point is calculated in standard cubic feet per minute from the flow meter data using the manufacturer's prescribed method.

(ii) Calculate values of the calibration coefficient for each test point:

$$K_V = \frac{Q_S \sqrt{T_V}}{P_V}$$

(iii) Plot K_v as a function of venturi inlet pressure. For choked flow, K_v will have a relatively constant value. As pressure decreases (vacuum increases), the venturi becomes unchoked and K_v decreases. (See Figure N84-8.)

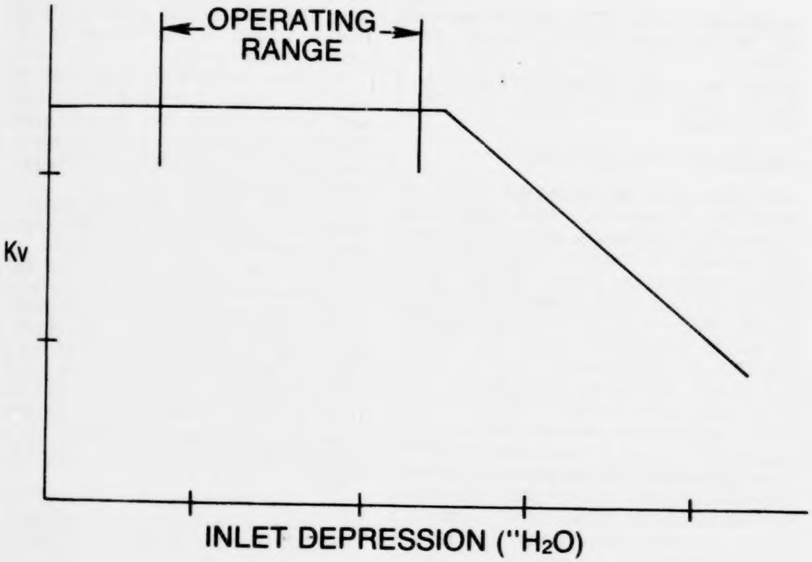


FIGURE N84-8— SONIC FLOW CHOKING

(iv) For a minimum of 8 points in the critical region calculate an average K_v and the standard deviation.

(v) If the standard deviation exceeds 0.3 percent of the average K_v, take corrective action.

(e) *CVS system verification.* The following "gravimetric" technique can be used to verify that the CVS and analytical instruments can accurately measure a mass of gas that has been injected into the system. (Verification can also be accomplished by constant flow metering using critical flow orifice devices.)

(1) Obtain a small cylinder that has been charged with pure propane.

(2) Determine the weight of the reference propane cylinder to an accuracy of ±0.2 percent or less of the actual amount of propane discharged into the system.

(3) Operate the CVS in the normal manner and release a quantity of pure propane into the system during the sampling period (approximately 5 minutes).

(4) The calculations of § 86.1342 are performed in the normal way except in the case of propane. The density of propane (17.30 g/ft^3/carbon atom (0.6109 kg/m^3/carbon atom)) is used in place of the density of exhaust hydrocarbons.

(5) The gravimetric mass is subtracted from the CVS measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

(6) Good engineering practice requires that the cause for any discrepancy greater than ± 2 percent must be found and corrected.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48144, Dec. 10, 1984; 52 FR 47871, Dec. 16, 1987]

§ 86.1319-90 CVS calibration.

(a) The CVS is calibrated using an accurate flowmeter and restrictor valve. The flowmeter calibration shall be traceable to the NBS, and will serve as the reference value (NBS "true" value) for the CVS calibration. (*Note:* In no case should an upstream screen or other restriction which can affect the flow be used ahead of the flowmeter unless calibrated throughout the flow range with such a device.) The CVS calibration procedures are designed for use of a "metering venturi" type flowmeter. Large radius or ASME flow nozzles are considered equivalent if traceable to NBS measurements. Other measurement systems may be used if shown to be equivalent under the test conditions in this section and traceable to NBS measurements. Measurements of the various flowmeter parameters are recorded and related to flow through the CVS. Procedures used by EPA for both PDP-CVS and CFV-CVS are outlined below. Other procedures yielding equivalent results may be used if approved in advance by the Administrator.

(b) After the calibration curve has been obtained, verification of the entire system may be performed by injecting a known mass of gas into the system and comparing the mass indicated by the system to the true mass injected. An indicated error does not necessarily mean that the calibration is wrong, since other factors can influence the accuracy of the system (*e.g.*, analyzer calibration, leaks, or HC hangup). A verification procedure is found in paragraph (e) of this section.

(c) *PDP calibration.* (1) The following calibration procedure outlines the equipment, the test configuration, and the various parameters which must be measured to establish the flow rate of the CVS pump.

(i) All the parameters related to the pump are simultaneously measured with the parameters related to a flowmeter which is connected in series with the pump.

(ii) The calculated flow rate, ft^3/min, (at pump inlet absolute pressure and temperature) can then be plotted versus a correlation function which is the value of a specific combination of pump parameters.

(iii) The linear equation which relates the pump flow and the correlation function is then determined.

(iv) In the event that a CVS has a multiple speed drive, a calibration for each range used must be performed.

(2) This calibration procedure is based on the measurement of the absolute values of the pump and flowmeter parameters that relate the flow rate at each point. Two conditions must be maintained to assure the accuracy and integrity of the calibration curve:

(i) The temperature stability must be maintained during calibration. (Flowmeters are sensitive to inlet temperature oscillations; this can cause the data points to be scattered. Gradual changes in temperature are acceptable as long as they occur over a period of several minutes.)

(ii) All connections and ducting between the flowmeter and the CVS pump must be absolutely void of leakage.

(3) During an exhaust emission test the measurement of these same pump parameters enables the user to calculate the flow rate from the calibration equation.

(4) Connect a system as shown in Figure N84-6. Although particular types of equipment are shown, other configurations that yield equivalent results may be used if approved in advance by the Administrator. For the system indicated, the following measurements and accuracies are required:

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Sensor-readout tolerances
Barometric pressure (corrected)	P_B	in. Hg (kPa)	±0.10 in. Hg (±0.340 kPa).
Ambient temperature	T_A	°F (°C)	±0.5 °F (±0.28 °C).
Air temperature into metering venturi	ETI	°F (°C)	±2.0 °F (±1.1 °C).
Pressure drop between the inlet and throat of metering venturi	EDP	in. H_20 (kPa)	±0.05 in H_2O (±0.012 kPa).
Air flow	Q_s	ft³/min (m³/min)	±0.5% of NBS "true" value.
Air temperature at CVS pump inlet	PTI	°F (°C)	±2.0 °F (±1.1 °C).
Pressure depression at CVS pump inlet	PPI	in. Fluid (kPa)	±0.13 in. Fluid (±0.055 kPa).
Specific gravity of manometer fluid (1.75 oil)	Sp.Gr.		
Pressure head at CVS pump outlet	PPO	in. Fluid (kPa)	±0.13 in. Fluid (±0.055 kPa).
Air temperature at CVS pump outlet (optional)	PTO	°F (°C)	±2.0 °F (±1.1 °C).
Pump revolutions during test period	N	Revs	± 1 Rev..
Elapsed time for test period	t	sec.	±0.5 sec.

(5) After the system has been connected as shown in Figure N84-6, set the variable restrictor in the wide open position and run the CVS pump for 20 minutes. Record the calibration data.

(6) Reset the restrictor valve to a more restricted condition in an increment of pump inlet depression that will yield a minimum of six data points for the total calibration. Allow the system to stabilize for 3 minutes and repeat the data acquisition.

(7) *Data analysis:*

(i) The air flow rate, Q_s, at each test point is calculated in standard cubic feet per minute (68°, 29.92 in. Hg.) from the flowmeter data using the manufacturer's prescribed method.

(ii) The air flow rate is then converted to pump flow, V_o, in cubic feet per revolution at absolute pump inlet temperature and pressure:

$V_o=(Q_s/n)\times(T_p/528)\times(29.92/P_p)$

Where:

(A) V_o=Pump flow, ft³/rev (m³/rev) at T_p, P_p.

(B) Q_s=Meter air flow rate in standard cubic feet per minute, standard conditions are 68 °F, 29.92 in. Hg (20 °C, 101.3 kPa).

(C) n=Pump speed in revolutions per minute.

(D) T_p=Pump inlet temperature °R(°K) =PTI+460 (°R), or =PTI+273 (°K).

(E) P_p=Absolute pump inlet pressure, in. Hg. (kPa)

$=P_B-\mathrm{PPI}(\mathrm{Sp.Gr.}/13.5955)$ and

$=PB-\mathrm{PPI}$ for SI units.

Where:

(F) P_B=barometric pressure, in. Hg. (kPa).

(G) PPI=Pump inlet depression, in. fluid (kPa).

(H) Sp.Gr.=Specific gravity of manometer fluid.

(iii) The correlation function at each test point is then calculated from the calibration data:

$$X_o = \frac{1}{n}\sqrt{\frac{\Delta p}{P_e}}$$

Where:

(A) X_o=correlation function.

(B) D_p=The pressure differential from pump inlet to pump outlet, in. Hg. (kPa).

$=P_{e}-P_p$.

(C) P_e=Absolute pump outlet pressure, in. Hg. (kPa)

$=P_B+\mathrm{PPO}(\mathrm{Sp.Gr.}/13.5955)$ and

$=P_B+\mathrm{PPO}$ *for SI units.*

Where:

(D) PPO=Pressure head at pump outlet, in. fluid (kPa).

(iv) A linear least squares fit is performed to generate the calibration equation which has the form:

$V_o=D_o-M(X_o)$

D_o and M are the intercept and slope constants, respectively, describing the regression line.

(8) A CVS system that has multiple speeds should be calibrated on each speed used. The calibration curves generated for the ranges will be approximately parallel and the intercept values, D_o, will increase as the pump flow range decreases.

(9) If the calibration has been performed carefully, the calculated values from the equation will be within ±0.50 percent of the measured value of V_o. Values of M will vary from one pump to another, but values of D_o for pumps of the same make, model and range should agree within ±3 percent of each other. Particulate influx over time will cause the pump slip to decrease, as reflected by lower values for M. Calibrations should be performed at pump start-up and after major maintenance to assure the stability of the pump slip rate. Analysis of mass injection data will also reflect pump slip stability.

(d) *CFV calibration.* (1) Calibration of the CFV is based upon the flow equation for a critical venturi. Gas flow is a function of inlet pressure and temperature:

$$Q_s = \frac{K_v P}{\sqrt{T}}$$

Where:

(i) Q_s=flow.

(ii) K_v=calibration coefficient.

(iii) P=absolute pressure.

(iv) T=absolute temperature.

The calibration procedure described in paragraph (d)(3) of this section establishes the value of the calibration coefficient at measured values of pressure, temperature and air flow.

(2) The manufacturer's recommended procedure shall be followed for calibrating electronic portions of the CFV.

(3) Measurements necessary for flow calibration are as follows:

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Tolerances
Barometric pressure (corrected).	P_B	in. Hg. (kPa).	±0.10 in. Hg. (±0.340 kPa).
Air temperature, into flowmeter.	ETI	°F (°C)	±0.5°F (±0.28 °C)
Pressure drop between the inlet and throat of metering venturi.	EDP	in. H_2O (kPa).	±0.05 in. H_2O (±0.012 kPa)
Air flow	Q_s	ft³/min (m³/min).	±0.5% of NBS "true" value.
CFV inlet depression.	PPI	in. fluid (kPa).	±0.13 in. fluid (±0.055 kPa).
Temperature at venturi inlet.	T_v	°F (°C)	±4.0°F (±2.22 °C)
Specific gravity of manometer fluid (1.75 oil).	Sp. Gr.		

(4) Set up equipment as shown in Figure N84-7 and eliminate leaks (Leaks between the flow measuring devices and the critical flow venturi will seriously affect the accuracy of the calibration.)

(5) Set the variable flow restrictor to the open position, start the blower, and allow the system to stabilize. Record data from all instruments.

(6) Vary the flow restrictor and make at least eight readings across the critical flow range of the venturi.

(7) *Data analysis.* The data recorded during the calibration are to be used in the following calculations:

(i) The air flow rate, Q_s, at each test point is calculated in standard cubic feet per minute from the flow meter data using the manufacturer's prescribed method.

(ii) Calculate values of the calibration coefficient for each test point:

$$K_v = \frac{Q_s \sqrt{T_v}}{P_v}$$

Where:

(A) Q_s=Flow rate in standard cubic feet per minute, at the standard conditions of 68 °F, 29.92 in Hg (20 °C, 101.3 kPa).

(B) T_v=Temperature at venturi inlet, °R(°K).

(C) P_v=Pressure at venturi inlet, in. Hg. (kPA)

$=P_B-PPI$ (Sp.GR./13.5955), and

$=P_B-PPI$ *for SI units.*

Where:

(D) PPI=Venturi inlet pressure depression, in. fluid (kPa).

(E) Sp.Gr.=Specific gravity of manometer fluid.

(iii) Plot K_v as a function of venturi inlet pressure. For choked flow, K_v will have a relatively constant value. As pressure decreases (vacuum increases), the venturi becomes unchoked and K_v decreases. (See Figure N84–8.)

(iv) For a minimum of 8 points in the critical region calculate an average K_v and the standard deviation.

(v) If the standard deviation exceeds 0.3 percent of the average K_v, take corrective action.

(e) *CVS system verification.* The following "gravimetric" technique can be used to verify that the CVS and analytical instruments can accurately measure a mass of gas that has been injected into the system. (Verification can also be accomplished by constant flow metering using critical flow orifice devices.)

(1) Obtain a small cylinder that has been charged with pure propane or carbon monoxide gas (CAUTION—carbon monoxide is poisonous). Obtain another small cylinder which has been charged with pure methanol if the system will be used for methanol-fueled vehicle testing. Since this cylinder will be heated to 150–155 °F, care must be taken to ensure that the liquid volume of methanol placed in the cylinder does not exceed approximately one-half of the total volume of the cylinder.

(2) Determine a reference cylinder weight to the nearest 0.01 grams.

(3) Operate the CVS in the normal manner and release a quantity of pure propane into the system during the sampling period (approximately 5 minutes).

(4) Following the completion of step (3) above, continue to operate the CVS in the normal manner and release a quantity of pure methanol into the system during the sampling period (approximately 5 minutes).

(5) The calculations of § 86.1342 are performed in the normal way except in the case of propane. The density of propane (17.30 g/ft³/carbon atom (0.6109 kg/m³/carbon atom)) is used in place of the density of exhaust hydrocarbons. In the case of methanol, the density of 37.71 g/ft³ (1.332 kg/m³) is used.

(6) The gravimetric mass is subtracted from the CVS measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

(7) Good engineering practice requires that the cause for any discrepancy greater than ±2 percent must be found and corrected.

[54 FR 14591, Apr. 11, 1989]

§ 86.1320–88 Gas meter or flow instrumentation calibration, particulate measurement.

(a) Sampling for particulate emissions requires the use of gas meters or flow instrumentation to determine flow through the particulate filters. This instrument shall receive initial and periodic calibrations as follows:

(1) (i) Install a calibration device in series with the instrument. A critical flow orifice, a bellmouth nozzle, a laminar flow element or an NBS traceable flow calibration device is required as the standard device.

(ii) The flow system should be checked for leaks between the calibration and sampling meters, including any pumps that may be part of the system, using good engineering practice.

(2) Flow air through the calibration system at the sample flow rate used for particulate testing and at the backpressure which occurs during the sample test.

(3) When the temperature and pressure in the system have stabilized, measure the indicated gas volume over a time period of at least 5 minutes or until a gas volume of at least ±1 percent accuracy can be determined by the calibration device. Record the stabilized air temperature and pressure upstream of the instrument and as required for the calibration device.

(4) Calculate air flow at standard conditions as measured by both the standard device and the instrument. (Standard conditions are defined as 68° F (20° C) and 29.92 in. of mercury (101.3 kPa).)

(5) Repeat the procedures of paragraphs (a) (2) through (4) of this section using at least two additional flow rates which bracket the typical operating range.

(6) If the air flow at standard conditions measured by the instrument differs from the standard measurement at any of the flow rates by ±1.0 percent of the maximum operating range or ±2.0 percent of the point (whichever is smaller), then a correction shall be made by either of the following two methods:

(i) Mechanically adjust the instrument so that it agrees with the calibration measurement at the specified flow rates using the criteria of paragraph (a)(6) of this section, or

(ii) Develop a continuous best fit calibration curve for the instrument (as a function of the calibration device flow measurement) from the calibration points to determine corrected flow. The points on the calibration curve relative to the calibration device measurements must be within ±1.0 percent of the maximum operating range or ±2.0 percent of the point (whichever is smaller).

(7) For double dilution systems, the accuracy of the secondary dilution flow measurement device should be within ±1.0 percent of the total flow through the filter.

(b) *Other systems.* A bell prover may be used to calibrate the instrument if the procedure outlined in ANSI B109.1-1973 is used. Prior approval by the Administrator is not required to use the bell prover.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10703, Mar. 15, 1985, as amended at 52 FR 47872, Dec. 16, 1987]

§ 86.1320-90 Gas meter or flow instrumentation calibration; particulate, methanol, and formaldehyde measurement.

(a) Sampling for particulate, methanol and formaldehyde emissions requires the use of gas meters or flow instrumentation to determine flow through the particulate filters, methanol impingers and formaldehyde impingers. These instruments shall receive initial and periodic calibrations as follows:

(1)(i) Install a calibration device in series with the instrument. A critical flow orifice, a bellmouth nozzle, or a laminar flow element or an NBS traceable flow calibration device is required as the standard device.

(ii) The flow system should be checked for leaks between the calibration and sampling meters, including any pumps that may be part of the system, using good engineering practice.

(2) Flow air through the calibration system at the sample flow rate used for particulate, methanol, and formaldehyde testing and at the backpressure which occurs during the sample test.

(3) When the temperature and pressure in the system have stabilized, measure the indicated gas volume over a time period of at least five minutes or until a gas volume of at least ±1 percent accuracy can be determined by the standard device. Record the stabilized air temperature and pressure upstream of the instrument and as required for the standard device.

(4) Calculate air flow at standard conditions as measured by both the standard device and the instrument(s). (Standard conditions are defined as 68 °F (20 °C) and 29.92 in Hg (101.3 kPa).)

(5) Repeat the procedures of paragraphs (a) (2) through (4) of this section using at least two flow rates which bracket the typical operating range.

(6) If the air flow at standard conditions measured by the instrument dif-

fers by ±1.0 percent of the maximum operating range or ±2.0 percent of the point (whichever is smaller), then a correction shall be made by either of the following two methods:

(i) Mechanically adjust the instrument so that it agrees with the calibration measurement at the specified flow rates using the criteria of paragraph (a)(6) of this section, or

(ii) Develop a continuous best fit calibration curve for the instrument (as a function of the calibration device flow measurement) from the calibration points to determine corrected flow. The points on the calibration curve relative to the calibration device measurements must be within ±1.0 percent of the maximum operating range of ±2.0 percent of the point (whichever is smaller).

(7) For double dilution systems, the accuracy of the secondary dilution flow measurement device should be within ±1.0 percent of the total flow through the filter.

(b) *Other systems.* A bell prover may be used to calibrate the instrument if the procedure outlined in ANSI B109.1-1973 is used. Prior approval by the Administrator is not required to use the bell prover.

[54 FR 14593, Apr. 11, 1989]

§ 86.1321-84 Hydrocarbon analyzer calibration.

The FID hydrocarbon analyzer shall receive the following initial and periodic calibration. The HFID shall be operated to a set point ±10° F (±5.5° C) between 365 and 385° F (185 and 197° C).

(a) *Initial and periodic optimization of detector response.* Prior to introduction into service and at least annually thereafter, the FID hydrocarbon analyzer shall be adjusted for optimum hydrocarbon response. Alternate methods yielding equivalent results may be used, if approved in advance by the Administrator.

(1) Follow good engineering practices for initial instrument start-up and basic operating adjustment using the appropriate fuel (see § 86.1314-84) and zero-grade air.

(2) Optimize on the most common operating range. Introduce into the analyzer a propane-in-air mixture with a propane concentration equal to approximately 90 percent of the most common operating range.

(3) One of the following procedures is required for FID or HFID optimization.

(i) For gasoline fueled engines, the procedures outlined in Society of Automotive Engineers (SAE) paper No. 770141, "Optimization of Flame Ionization Detector for Determination of Hydrocarbons in Diluted Automobile Exhaust"; author, Glen D. Reschke.

(ii) For diesel fueled engines, the HFID optimization procedures outlined in 40 CFR 86.331-79, except for the oxygen interference checks in § 86.331-79(d).

(iii) Alternative procedures may be used if approved in advance by the Administrator.

(4) After the optimum flow rates have been determined, they are recorded for future reference.

(b) *Initial and periodic calibration.* Prior to introduction into service and monthly thereafter, the FID or HFID hydrocarbon analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate and pressures as when analyzing samples. Calibration gases shall be introduced directly at the analyzer, unless the "overflow" calibration option of § 86.1310-84(b)(3)(i) for the HFID is taken.

(1) Adjust analyzer to optimize performance.

(2) Zero the hydrocarbon analyzer with zero-grade air.

(3) Calibrate on each used operating range with propane-in-air calibration gases having nominal concentrations of 15, 30, 45, 60, 75 and 90 percent of that range. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48144, Dec. 10, 1984; 52 FR 47871, Dec. 16, 1987]

§ 86.1321-90 Hydrocarbon analyzer calibration.

The FID hydrocarbon analyzer shall receive the following initial and periodic calibration. The HFID used with petroleum-fueled diesel engines shall be operated to a set point ±10 °F (±5.5 °C) between 365 and 385 °F (185 and 197 °C). The HFID used with methanol-fueled engines shall be operated at 235±15 °F (113±8 °C).

(a) *Initial and periodic optimization of detector response.* Prior to introduction into service and at least annually thereafter, the FID hydrocarbon analyzer shall be adjusted for optimum hydrocarbon response. Alternate methods yielding equivalent results may be used, if approved in advance by the Administrator.

(1) Follow good engineering practices for initial instrument start-up and basic operating adjustment using the appropriate fuel (see § 86.1314) and zero-grade air.

(2) Optimize on the most common operating range. Introduce into the analyzer a propane-in-air mixture with a propane concentration equal to approximately 90 percent of the most common operating range.

(3) One of the following procedures is required for FID or HFID optimization:

(i) The procedures outlined in Society of Automotive Engineers (SAE) paper No. 770141, "Optimization of Flame Ionization Detector for Determination of Hydrocarbons in Diluted Automobile Exhaust"; author, Glenn D. Reschke.

(ii) The HFID optimization procedures outlined in 40 CFR Part 86, Subpart D.

(iii) Alternative procedures may be used if approved in advance by the Administrator.

(4) After the optimum flow rates have been determined, they are recorded for future reference.

(b) *Initial and periodic calibration.* Prior to introduction into service and monthly thereafter, the FID or HFID hydrocarbon analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate and pressures as when analyzing samples. Calibration gases shall be introduced directly at the analyzer, unless the "overflow" calibration option of § 86.1310(b)(3)(i) for the HFID is taken.

(1) Adjust analyzer to optimize performance.

(2) Zero the hydrocarbon analyzer with zero-grade air.

(3) Calibrate on each used operating range with propane-in-air calibration gases having nominal concentrations of 15, 30, 45, 60, 75 and 90 percent of that range. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

(c) *FID response factor to methanol.* When the FID analyzer is to be used for the analysis of hydrocarbon samples containing methanol, the methanol response factor of the analyzer shall be established. The methanol response factor shall be determined at several concentrations in the range of concentrations in the exhaust sample.

(1) The bag sample of methanol for analysis in the FID shall be prepared using the apparatus shown in Figure N90-10. A known volume of methanol is injected, using a microliter syringe, into the heated mixing zone (250 °F (121 °C)) of the apparatus. The methanol is vaporized and swept into the sample bag with a known volume of zero-grade air measured by a dry gas meter.

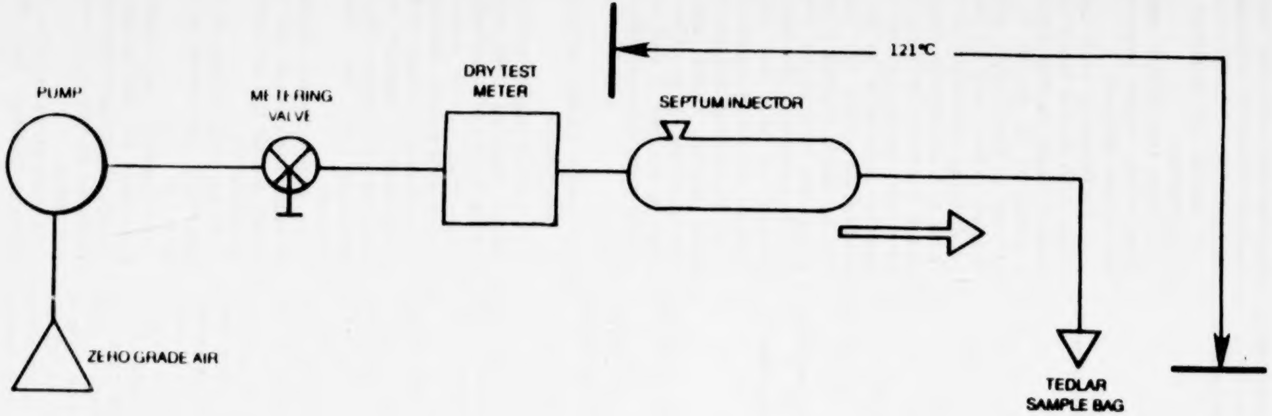

PUMP
METERING VALVE
DRY TEST METER
SEPTUM INJECTOR
121°C
ZERO GRADE AIR
TEDLAR SAMPLE BAG

FIGURE N90-10 APPARATUS FOR PREPARATION OF FID METHANOL RESPONSE CALIBRATION MIX

(2) The bag sample is analyzed using the FID.

(3) The FID response factor, r, is calculated as follows:

r=FIDppm/SAMppm

Where:

(i) r=FID response factor.

(ii) FIDppm=FID reading in ppmC.

(iii) SAMppm=methanol concentration in the sample bag in ppmC

$$= \frac{0.02406 \times \text{fuel injected} \times \text{fuel density}}{\text{Air volume} \times \text{mol. wt. } CH_3OH}$$

Where:

(iv) 0.02406=volume of one mole at 29.92 in Hg and 68 °F, m^3.

(v) Fuel injected=volume of methanol injected, ml.

(vi) Fuel density=density of methanol, 0.7914 g/ml.

(vii) Air volume=volume of zero-grade air, m^3.

(viii) Mol. Wt. CH_3OH=32.04.

[54 FR 14594, Apr. 11, 1989]

§ 86.1322-84 Carbon monoxide analyzer calibration.

The NDIR carbon monoxide analyzer shall receive the following initial and periodic calibration.

(a) *Initial and periodic interference check.* Prior to its introduction into service and annually thereafter, the NDIR carbon monoxide analyzer shall be checked for response to water vapor and CO_2:

(1) Follow good engineering practices for instrument start-up and operation. Adjust the analyzer to optimize performance on the most sensitive range to be used.

(2) Zero the carbon monoxide analyzer with either zero-grade air or zero-grade nitrogen.

(3) Bubble a mixture of 3 percent CO_2 in N_2 through water at room temperature and record analyzer response.

(4) An analyzer response of more than 1 percent of full scale for ranges above 300 ppm full scale or more than 3 ppm on ranges below 300 ppm full scale requires corrective action. (Use of conditioning columns is one form of corrective action which may be taken.)

(b) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter, the NDIR carbon monoxide analyzer shall be calibrated.

(1) Adjust the analyzer to optimize performance.

(2) Zero the carbon monoxide analyzer with either zero-grade air or zero-grade nitrogen.

(3) Calibrate on each used operating range with carbon monoxide-in-N_2 calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. Additional calibration points may be generated. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit not-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

(c) The initial and periodic interference, system check, and calibration test procedures specified in 40 CFR Part 86, Subpart D may be used in lieu of the procedures specified in this section.

§ 86.1323-84 Oxides of nitrogen analyzer calibration.

The chemiluminescent oxides of nitrogen analyzer shall receive the following initial and periodic calibration.

(a) Prior to its introduction into service and weekly thereafter, the chemiluminescent oxides of nitrogen analyzer shall be checked for NO_2 to NO converter efficiency. Figure N84-9 is a reference for the following paragraphs:

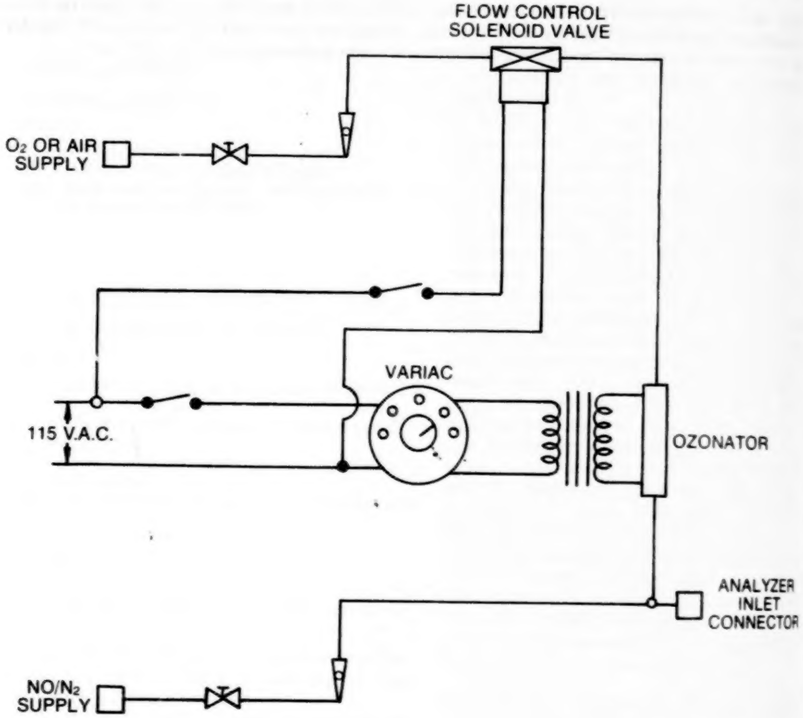
(1) Follow good engineering practices for instrument start-up and operation. Adjust the analyzer to optimize performance.

(2) Zero the oxides of nitrogen analyzer with zero-grade air or zero-grade nitrogen.

(3) Connect the outlet of the NO_x generator to the sample inlet of the oxides of nitrogen analyzer which has been set to the most common operating range.

(4) Introduce into the NO_x generator analyzer-system an NO-in-nitrogen

(N_2) mixture with an NO concentration equal to approximately 80 percent of the most common operating range. The NO_2 content of the gas mixture shall be less than 5 percent of the NO concentration.


FLOW CONTROL
SOLENOID VALVE
O_2 OR AIR
SUPPLY
VARIAC
115 V.A.C.
OZONATOR
ANALYZER
INLET
CONNECTOR
NO/N_2
SUPPLY

(SEE FIG. N84-5 FOR SYMBOL LEGEND)
FIGURE N84-9 — NO_x CONVERTER EFFICIENCY DETECTOR

(5) With the oxides of nitrogen analyzer in the NO mode, record the concentration of NO indicated by the analyzer.

(6) Turn on the NO_x generator O_2 (or air) supply and adjust the O_2 (or air) flow rate so that the NO indicated by the analyzer is about 10 percent less than indicated in paragraph (a)(5) of this section. Record the concentration of NO in this $NO+O_2$ mixture.

(7) Switch the NO_x generator to the generation mode and adjust the generation rate so that the NO measured on the analyzer is 20 percent of that measured in paragraph (a)(5) of this section. There must be at least 10 percent unreacted NO at this point. Record the concentration of residual NO.

(8) Switch the oxides of nitrogen analyzer to the NO_x mode and measure total NO_x. Record this value.

(9) Switch off the NO_x generator but maintain gas flow through the system. The oxides of nitrogen analyzer will indicate the NO_x in the $NO+O_2$ mixture. Record this value.

(10) Turn off the NO_x generator O_2 (or air) supply. The analyzer will now indicate the NO_x in the original NO-in-N_2 mixture. This value should be no more than 5 percent above the value indicated in paragraph (a)(4) of this section.

(11) Calculate the efficiency of the NO_x converter by substituting the concentrations obtained into the following equation:

$$\text{Percent efficiency} = \left(1 + \frac{a-b}{c-d}\right) \times 100$$

Where:

a=concentration obtained in paragraph (a)(8),
b=concentration obtained in paragraph (a)(9),
c=concentration obtained in paragraph (a)(6),
d=concentration obtained in paragraph (a)(7).

If converter efficiency is not greater than 90 percent corrective action will be required.

(b) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter, the chemiluminescent oxides of nitrogen analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate as when analyzing samples. Proceed as follows:

(1) Adjust analyzer to optimize performance.

(2) Zero the oxides of nitrogen analyzer with zero-grade air or zero-grade nitrogen.

(3) Calibrate on each normally used operating range with NO-in-N_2 calibration gases with nominal concentrations of 15, 30, 45, 60, 75 and 90 percent of that range. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

(c) The initial and periodic interference, system check, and calibration test procedures specified in 40 CFR Part 86, Subpart D, may be used in lieu of the procedures specified in this section.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48144, Dec. 10, 1984]

§ 86.1324-84 Carbon dioxide analyzer calibration.

Prior to its introduction into service and monthly thereafter, the NDIR carbon dioxide analyzer shall be calibrated as follows:

(a) Follow good engineering practices for instrument start-up and operation. Adjust the analyzer to optimize performance.

(b) Zero the carbon dioxide analyzer with either zero-grade air or zero-grade nitrogen.

(c) Calibrate on each normally used operating range with carbon dioxide-in-N_2 calibration or span gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. Additional calibration points may be generated. For each range calibrated, if the deviaton from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

(d) The initial and periodic interference, system check, and calibration test procedures specified in 40 CFR Part 86, Subpart D, may be used in lieu of the procedures in this section.

§ 86.1326-84 Calibration of other equipment.

Other test equipment used for testing shall be calibrated as often as required by good engineering practice.

§ 86.1326-90 Calibration of other equipment.

Other test equipment used for testing shall be calibrated as often as required by the manufacturer or as necessary according to good practice. Specific equipment requiring calibration is the gas chromatograph and flame ionization detector used in measuring methanol and the high pressure liquid chromatograph (HPLC) and ultraviolet detector for measuring formaldehyde.

[54 FR 14596, Apr. 11, 1989]

§ 86.1327-84 Engine dynamometer test procedures; overview.

(a)(1) The engine dynamometer test procedure is designed to determine the brake-specific emissions of hydrocarbons, carbon monoxide, and oxides of nitrogen.

(i) The dynamometer test procedure consists of a "cold" start test following either natural or forced cool-down periods described in § 86.1334-84 and § 86.1335-84, respectively. A "hot" start test follows the "cold" start test after a hot soak period of 20 minutes.

(ii) The idle test of Subpart P may be run after the "hot" start test.

(2) The exhaust emissions are diluted with ambient air and a continuous proportional sample is collected for analysis during the cold and hot start tests.

(i) The composite samples collected are analyzed either in bags or continuously for hydrocarbons (HC), carbon monoxide (CO), carbon dioxide (CO_2), and oxides of nitrogen (NO_x).

(ii) A bag or continuous sample of the dilution air is similarly analyzed for background levels of hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen.

(b) Engine torque and rpm shall be recorded continuously during both the cold and hot start tests. Data points shall be recorded at least once every second.

(c) Using the torque and rpm feedback signals the brake horsepower is integrated with respect to time for the cold and hot cycles. This produces a brake horsepower-hour value that enables the brake-specific emissions to be determined (see § 86.1342-84, Calculations; exhaust emissions).

(d)(1) When an engine is tested for exhaust emissions or is operated for service accumulation on an engine dynamometer, the complete engine shall be tested, with all emission control devices installed and functioning.

(2) Evaporative emission controls need not be connected if data are provided to show that normal operating conditions are maintained in the engine induction system.

(3) On air cooled engines, the fan shall be installed.

(4) Additional accessories (e.g., oil cooler, alternators, air compressors, etc.) may be installed or their loading simulated if typical of the in-use application.

(5) The engine may be equipped with a production type starter.

(e)(1) Means of engine cooling which will maintain the engine operating temperatures (e.g., temperatures of intake air, oil, water, etc.) at approximately the same temperature as specified by the manufacturer shall be used.

(2) Auxiliary fan(s) may be used to maintain engine cooling during operation on the dynamometer.

(3) Rust inhibitors and lubrication additives may be used, up to the levels recommended by the additive manufacturer.

(4) Antifreeze mixtures and other coolants typical of those approved for use by the manufacturer may be used.

(f) *Exhaust system.* The exhaust system shall meet the following requirements:

(1) *Gasoline-fueled engines.* A chassis-type exhaust system shall be used. For all catalyst systems, the distance from the exhaust manifold flange(s) to the catalyst shall be the same as in the vehicle configuration unless the manufacturer provides data showing equivalent performance at another location.

(2) *Diesel-fueled engines.* A facility-type exhaust system shall be used, and shall meet the following requirements:

(i) Exhaust system length from the exit of the engine exhaust manifold or turbocharger outlet to the dilution tunnel is required to be not more than 32 feet. Exhaust system tubing must be composed of either stainless steel or the type of steel found in-use. This tubing shall have a maximum inside diameter of 6.0 inches (15.2 cm). If the exhaust system exceeds 20 feet in length and if particulate measurements are to be made, it is recommended that all solid tubing be insulated. If particulate measurements are to be made, it is also recommended that all solid tubing be smooth.

(ii) Short section (altogether not to exceed 20 percent of the entire exhaust system length) of flexible tubing at connection points are allowed.

(iii) If the tubing is required to be insulated, the radial thickness of the insulation must be at least 1.0 inch. The thermal conductivity of the insulating material must have a value no greater than 0.75 BTU-in/hr/ft^2/°F measured at 700 °F.

(iv) The exhaust back pressure or restriction may be set with a valve (and muffler omitted) and restrictions shall be typical of those seen in the actual average vehicle exhaust system configuration.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48144, Dec. 10, 1984; 52 FR 47872, Dec. 16, 1987]

§ 86.1327-88 Engine dynamometer test procedures; overview.

(a) The engine dynamometer test procedure is designed to determine the brake-specific emissions of hydrocarbons, carbon monoxide, oxides of nitrogen and particulate (diesels only). The test procedure consists of a "cold" start test following either natural or forced cool-down periods described in § 86.1334-84 and § 86.1335-84, respectively. A "hot" start test follows the "cold" start test after a hot soak of 20 minutes. The idle test of Subpart P may be run after the "hot" start test. The exhaust emissions are diluted with ambient air and a continuous proportional sample is collected for analysis during both the cold- and hot-start tests. The composite samples collected are analyzed either in bags or continuously for hydrocarbons (HC), carbon monoxide (CO), carbon dioxide (CO_2), and oxides of nitrogen (NO_x). A bag or continuous sample of the dilution air is similarly analyzed for background levels of hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen. In addition, for diesels only, particulates are collected on fluorocarbon-coated glass fiber filters or fluorocarbon-based (membrane) filters, and the dilution air may be prefiltered.

(b) Engine torque and rpm shall be recorded continuously during both the cold and hot start tests. Data points shall be recorded at least once every second.

(c) Using the torque and rpm feedback signals the brake horsepower is integrated with respect to time for the cold and hot cycles. This produces a brake horsepower-hour value that enables the brake-specific emissions to be determined (see § 86.1342-84, Calculations; gaseous exhaust emissions and § 86.1343-87, Calculations; particulate exhaust emissions).

(d)(1) When an engine is tested for exhaust emissions or is operated for service accumulation on an engine dynamometer, the complete engine shall be tested, with all emission control devices installed and functioning.

(2) Evaporative emission controls need not be connected if data are provided to show that normal operating conditions are maintained in the engine induction system.

(3) On air-cooled engines, the fan shall be installed.

(4) Additional accessories (*e.g.*, oil cooler, alternators, air compressors, etc.) may be installed or their loading simulated if typical of the in-use application.

(5) The engine may be equipped with a production type starter.

(e) Means of engine cooling which will maintain the engine operating temperatures (*e.g.*, temperatures of intake air, oil, water, etc.) at approximately the same temperature as specified by the manufacturer shall be used. Auxiliary fan(s) may be used to maintain engine cooling during operation on the dynamometer. Rust inhibitors and lubrication additives may be used, up to the levels recommended by the additive manufacturer. Antifreeze mixtures and other coolants typical of those approved for use by the manufacturer may be used.

(f) *Exhaust system.* The exhaust system shall meet the following requirements:

(1) *Gasoline-fueled engines.* A chassis-type exhaust system shall be used. For all catalyst systems, the distance from the exhaust manifold flange(s) to the catalyst shall be the same as in the vehicle configuration unless the manufacturer provides data showing equivalent performance at another location.

(2) *Diesel engines.* Either a chassis-type or a facility-type exhaust system or both systems simultaneously may be used. The exhaust backpressure or restriction shall be typical of those seen in the actual average vehicle exhaust system configuration and may be set with a valve (muffler omitted).

(i) The diesel engine exhaust system shall meet the following requirements:

(A) The total length of the tubing from the exit of the engine exhaust manifold or turbocharger outlet to the primary dilution tunnel should not exceed 32 feet.

(B) The initial portion of the exhaust system may consist of a typical in-use (*i.e.*, length, diameter, material, etc.) chassis-type exhaust system.

(C) The distance from the exhaust manifold flange(s) to any exhaust aftertreatment device shall be the same as in the vehicle configuration unless the manufacturer is able to demonstrate equivalent performance at another location.

(D) If the exhaust system tubing from the exit of the engine exhaust manifold or turbocharger outlet to the primary dilution tunnel exceeds 12 feet in length, than all tubing in excess of 12 feet (chassis and/or facility type) shall be insulated.

(E) If the tubing is required to be insulated, the radial thickness of the insulation must be at least 1.0 inch. The thermal conductivity of the insulating material must have a value no greater than 0.75 BTU-in/hr/ft^2/°F measured at 700 °F.

(F) A smoke meter or other instrumentation may be inserted into the exhaust system tubing. If this option is exercised in the insulated portion of the tubing, then a minimal amount of tubing not to exceed 18 inches may be left uninsulated. However, no more than 12 feet of tubing can be left uninsulated in total, including the length at the smoke meter.

(ii) The facility-type exhaust system shall meet the following requirements:

(A) It must be composed of smooth tubing made of typical in-use steel or stainless steel. This tubing shall have a maximum inside diameter of 6.0 in. (15.2 cm).

(B) Short sections (altogether not to exceed 20 percent of the entire tube length) of flexible tubing at connection points are allowed.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10703, Mar. 15, 1985, as amended at 52 FR 47872, Dec. 16, 1987]

§ 86.1327–90 Engine dynamometer test procedures; overview.

(a) The engine dynamometer test procedure is designed to determine the brake specific emissions of hydrocarbons, carbon monoxide, oxides of nitrogen, particulate (petroleum-fueled and methanol-fueled diesel engines), and methanol and formaldehyde (for methanol-fueled diesel engines). The test procedure consists of a "cold" start test following either natural or forced cool-down periods described in §§ 86.1334 and 86.1335, respectively. A "hot" start test follows the "cold" start test after a hot soak of 20 minutes. The idle test of Subpart P may be run after the "hot" start test. The exhaust emissions are diluted with ambient air and a continuous proportional sample is collected for analysis during both the cold- and hot-start tests. The composite samples collected are analyzed either in bags or continuously for hydrocarbons (HC), carbon monoxide (CO), carbon dioxide (CO_2), and oxides of nitrogen (NOx), or in sample collection impingers for methanol (CH_3OH) and sample collection impingers (or capsules) for formaldehyde (HCHO). Measurement of CH_3OH and HCHO may be omitted for 1990 through 1994 model year methanol-fueled engines when a FID calibrated on methanol is used. A bag or continuous sample of the dilution air is similarly analyzed for background levels of hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen and, if appropriate, methanol and formaldehyde. In addition, for petroleum-fueled and methanol-fueled diesel engines, particulates are collected on fluorocarbon-coated glass fiber filters or fluorocarbon-based (membrane) filters, and the dilution air may be prefiltered.

(b) Engine torque and rpm shall be recorded continuously during both the cold and hot start tests. Data points shall be recorded at least once every second.

(c) Using the torque and rpm feedback signals the brake horsepower is integrated with respect to time for the cold and hot cycles. This produces a brake horsepower-hour value that enables the brake-specific emissions to be determined (*see* § 86.1342, Calculations; gaseous exhaust emissions., and § 86.1343, Calculations; particulate exhaust emissions.).

(d)(1) When an engine is tested for exhaust emissions or is operated for service accumulation on an engine dynamometer, the complete engine shall be tested, with all emission control devices installed and functioning.

(2) Evaporative emission controls need not be connected if data are provided to show that normal operating conditions are maintained in the engine induction system.

(3) On air-cooled engines, the fan shall be installed.

(4) Additional accessories (*e.g.*, oil cooler, alternators, air compressors, etc.) may be installed or their loading simulated if typical of the in-use application.

(5) The engine may be equipped with a production type starter.

(e) Means of engine cooling which will maintain the engine operating temperatures (*e.g.*, temperatures of intake air, oil, water, etc.) at approximately the same temperature as specified by the manufacturer shall be used. Auxiliary fan(s) may be used to maintain engine cooling during operation on the dynamometer. Rust inhibitors and lubrication additives may be used, up to the levels recommended by the additive manufacturer. Antifreeze mixtures and other coolants typical of those approved for use by the manufacturer may be used.

(f) *Exhaust system.* The exhaust system shall meet the following requirements:

(1) *Gasoline-fueled and methanol-fueled Otto-cycle engines.* A chassis-type exhaust system shall be used. For all catalyst systems, the distance from the exhaust manifold flange(s) to the catalyst shall be the same as in the vehicle configuration unless the manufacturer provides data showing equivalent performance at another location.

(2) *Petroleum-fueled and methanol-fueled diesel engines.* Either a chassis-type or a facility-type exhaust system or both systems simultaneously may be used. The exhaust backpressure or restriction shall be typical of those seen in the actual average vehicle exhaust system configuration and may be set with a valve (muffler omitted).

(i) The engine exhaust system shall meet the following requirements:

(A) The total length of the tubing from the exit of the engine exhaust manifold or turbocharger outlet to the primary dilution tunnel should not exceed 32 feet (9.8 m).

(B) The initial portion of the exhaust system may consist of a typical in-use (*i.e.*, length, diameter, material, *etc.*) chassis-type exhaust system.

(C) The distance from the exhaust manifold flange(s) to any exhaust aftertreatment device shall be the same as in the vehicle configuration unless the manufacturer is able to demonstrate equivalent performance at another location.

(D) If the exhaust system tubing from the exit of the engine exhaust manifold or turbocharger outlet to the primary dilution tunnel exceeds 12 feet (3.7 m) in length, then all tubing in excess of 12 feet (3.7 m) (chassis and/or facility type) shall be insulated.

(E) If the tubing is required to be insulated, the radial thickness of the insulation must be at least 1.0 inch. The thermal conductivity of the insulating material must have a value no greater than 0.75 BTU-in/hr/ft^2/°F measured at 700 °F.

(F) A smoke meter or other instrumentation may be inserted into the exhaust system tubing. If this option is exercised in the insulated portion of the tubing, then a minimal amount of tubing not to exceed 18 inches may be left uninsulated. However, no more than 12 feet of tubing can be left uninsulated in total, including the length at the smoke meter.

(ii) The facility-type exhaust system shall meet the following requirements:

(A) It must be composed of smooth tubing made of typical in-use steel or stainless steel. This tubing shall have a maximum inside diameter of 6.0 in (15 cm).

(B) Short sections (altogether not to exceed 20 percent of the entire tube length) of flexible tubing at connection points are allowed.

[54 FR 14596, Apr. 11, 1989]

§ 86.1330-84 Test sequence; general requirements.

(a) The test sequence shown in Figure N84-10 shows the major steps of the test procedure.

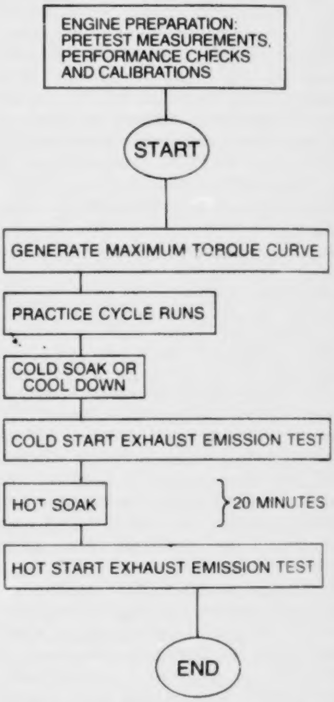

ENGINE PREPARATION: PRETEST MEASUREMENTS, PERFORMANCE CHECKS AND CALIBRATIONS
START
GENERATE MAXIMUM TORQUE CURVE
PRACTICE CYCLE RUNS
COLD SOAK OR COOL DOWN
COLD START EXHAUST EMISSION TEST
HOT SOAK
20 MINUTES
HOT START EXHAUST EMISSION TEST
END

FIGURE N84-10— TEST SEQUENCE

(b) *Control of Air Temperature.* (1) The temperature of the CVS dilution air shall be maintained above 68 °F (20 °C) throughout the test sequence, except as permitted by § 86.1335-84.

(2) For engines with auxiliary emission control devices which are temperature dependent (e.g., chokes, air cleaner hot air doors) the test cell ambient air temperature and the temperature of the engine intake air shall be maintained at 25° C ±5° C (77° F ±9° F) throughout the test sequence.

(3) For engines which are not equipped with temperature dependent auxiliary emission control devices, the test cell ambient air temperature and

the temperature of the engine intake air shall be greater than 20° C (68° F). No corrections will be made in test results or measured engine power if 30° C (86° F) is exceeded.

(4) The only exceptions to these temperatures are as noted in § 86.1335-84.

(c) No control of ambient air, engine intake air or CVS dilution air humidity is required.

(d) The idle test of Subpart P may be run after completion of the hot start exhaust emission test, if applicable.

(e) The barometric pressure observed during the generation of the maximum torque curve shall not deviate more than 1 inch Hg from the value measured at the beginning of the map. The average barometric pressure observed during the exhaust emission test must be within 1 inch Hg of the average observed during the maximum torque curve generation.

(f) *Diesel-Fueled Engines only.* (1)(i) Air inlet and exhaust restrictions shall be set to represent the average restrictions which would be seen in use in a representative application.

(ii) Inlet depression and exhaust backpressure shall be set with the engine operating at rated speed and wide open throttle, except for the case of inlet depression for naturally aspirated engines, which shall be set at maximum engine speed and nominal zero load (high idle).

(iii) The location at which the inlet depression and exhaust backpressure is measured shall be specified by the manufacturer.

(iv) The settings shall take place during the final mode of the preconditioning prior to determining the maximum torque curve.

(2)(i) The temperature of the inlet fuel to the engine shall not exceed 110 °F (or 130 °F during the first 10 seconds of the hot start test).

(ii) The pressure of the inlet fuel and the point at which it is measured shall be specified by the manufacturer.

(g) Pre-test engine measurements (e.g., governed diesel-fueled engine high idle speed, diesel-fueled engine fuel flows, etc.), pre-test engine performance checks (e.g., verification of actual rated rpm, etc.) and pre-test system calibrations (e.g., inlet and exhaust restrictions, etc.) shall be made prior to generation of the maximum torque curve. This can be done during engine preconditioning, or at the manufacturer's convenience subject to the requirements of good engineering practice.

[48 FR 52210, Nov. 16, 1983, as amended at 52 FR 47872, Dec. 16, 1987]

§ 86.1330-90 Test sequence; general requirements.

(a) The test sequence shown in Figure N84-10 shows the major steps of the test procedure.

(b) *Control of air temperature.* (1) The temperature of the CVS dilution air shall be maintained at greater than 68 °F (20 °C) throughout the test sequence, except as permitted by § 86.1335-90.

(2) For engines with auxiliary emission control devices which are temperature dependent (*e.g.*, chokes, air cleaner hot air doors) the test cell ambient air temperature and the temperature of the engine intake air shall be maintained at 77 °±9 °F (25 °C±5 °C) throughout the test sequence.

(3) For engines which are not equipped with temperature dependent auxiliary emission control devices, the test cell ambient air temperature and the temperature of the engine intake air shall be greater than 68 °F (20 °C). No corrections will be made in test results or measured engine power if 86 °F (30 °C) is exceeded.

(4) The only exceptions to these temperatures are as noted in § 86.1335.

(c) No control of ambient air, engine intake air or CVS dilution air humidity is required.

(d) The idle test of Subpart P may be run after completion of the hot start exhaust emission test, if applicable.

(e) The barometric pressure observed during the generation of the maximum torque curve shall not deviate more than 1 in. Hg. from the value measured at the beginning of the map. The average barometric pressure observed during the exhaust emission test must be within 1 in. Hg. of the average observed during the maximum torque curve generation.

(f) *Petroleum-fueled and methanol-fueled diesel engines.* (1)(i) Air inlet and exhaust restrictions shall be set to represent the average restrictions which would be seen in use in a representative application.

(ii) Inlet depression and exhaust backpressure shall be set with the engine operating at rated speed and wide open throttle, except for the case of inlet depression for naturally aspirated engines, which shall be set at maximum engine speed and nominal zero load (high idle).

(iii) The location at which the inlet depression and exhaust backpressure is measured shall be specified by the manufacturer.

(iv) The settings shall take place during the final mode of the preconditioning prior to determining the maximum torque curve.

(2)(i) The temperature of the inlet fuel to the engine shall not exceed 110 °F (or 130 °F during the first 10 seconds of the hot start test).

(ii) The pressure of the inlet fuel and the point at which it is measured shall be specified by the manufacturer.

(g) Pre-test engine measurements (*e.g.,* governed petroleum-fueled or methanol-fueled diesel engine high idle speed, petroleum-fueled or methanol-fueled diesel engine fuel flows, *etc.*), pre-test engine performance checks (*e.g.,* verification of actual rated rpm, *etc.*) and pre-test system calibrations (*e.g.,* inlet and exhaust restrictions, *etc.*) shall be made prior to generation of the maximum torque curve. This can be done during engine preconditioning, or at the manufacturer s convenience subject to the requirements of good engineering practice.

[54 FR 14597, Apr. 11, 1989]

§ 86.1332-84 Engine mapping procedures.

(a) Mount test engine on the engine dynamometer.

(b) Determine minimum mapping speed. The minimum speed is defined as the warm engine curb idle rpm.

(c) Determine maximum mapping speed per the following methodologies. (Note paragraph (d)(1) of this section.)

(1) *Gasoline-fueled engines.* (i) For ungoverned engines using the transient operating cycle set forth in paragraph (f)(1) of Appendix I to this part, the maximum mapping speed shall be no less than that calculated from the following equation:

Maximum speed=

$$\text{curb idle rpm} + \frac{105\ (\text{measured rated rpm—curb idle rpm})}{100}$$

or when a 3.0 percent drop in maximum horsepower occurs, whichever of the two is greater.

(ii) For ungoverned engines using the transient operating cycle set forth in paragraph (f)(3) of Appendix I to this part, the maximum mapping speed shall be no less than that calculated from the following equation:

Maximum speed=

$$\text{curb idle rpm} + \frac{115\ (\text{measured rated rpm—curb idle rpm})}{100}$$

or when a 3.0 percent drop in horsepower occurs, whichever of the two is greater.

(iii) For governed engines the maximum mapping speed shall be no less than either that speed at which the wide-open throttle torque drops off to zero, or the maximum speed as calculated for ungoverned engines (paragraph (c)(1)(i) of this section).

(2) *Diesel-fueled engines.* (i) For ungoverned engines the maximum mapping speed shall be no less than that calculated from the following equation:

Maximum speed=

$$\text{curb idle rpm} + \frac{113\ (\text{measured rated rpm—curb idle rpm})}{100}$$

or when a 3.0 percent drop in horsepower occurs, whichever of the two is greater.

(ii) For governed engines the maximum mapping speed shall be no less than either that speed at which wide-open throttle torque drops off to zero, or the maximum speed as calculated for ungoverned engines, (paragraph (c)(2)(i) of this section).

(d) *Perform an engine power map.* (1) During engine preparation or warm-up, the engine may be operated such that a preliminary estimate of measured rated rpm can be made.

(2) *Gasoline-fueled engines.* (i) For a cold engine, start the engine and operate at zero load in accordance with the manufacturer's start-up and warm-up procedures for 1 minute ±30 seconds.

(ii) Operate the engine at a torque equivalent to 10±3 percent of the most recent determination of maximum torque for 4 minutes ±30 seconds at 2,000 rpm.

(iii) Operate the engine at a torque equivalent to 55 ±5 percent of the most recent determination of maximum torque for 35 minutes ±1 minute at 2,000 rpm.

(iv) Operate the engine at idle (minimum speed).

(v) Open the throttle fully.

(vi) While maintaining wide-open throttle and full-load, maintain minimum engine speed for at least 15 seconds. Record the average torque during the last 5 seconds.

(vii) In no greater than 100 ±20 rpm increments, determine the maximum torque curve from minimum speed to maximum speed. Hold each test point for 15 seconds and record the average torque over the last 5 seconds.

(viii) *Alternate mapping technique.* In place of paragraphs (d)(2) (vi) and (vii) of this section a continual sweep of rpm is allowed. While operating at wide-open throttle, the engine speed is increased at an average rate of 8 rpm/second (±1 rpm/second) from minimum speed to maximum speed. Speed and torque points shall be recorded at a sample rate of at least one point per second.

(ix) Recalculate the maximum speed per paragraph (c)(1) (i) or (ii) of this section using the measured rated speed derived from the new maximum torque curve. If the new maximum speed lies outside the range of speeds encompassed by the actual map, then the map shall be considered void, and another map will need to be run using the newly derived measured rated speed in all calculations.

(x) For warm engines, the entire warm-up procedure specified in paragraphs (d)(2) (i) through (iii) of this section need not be repeated. It is sufficient for an engine already at normal operating temperatures to be operated at the conditions specified in paragraph (d)(2)(iii) of this section until oil and water temperatures are stabilized, after which the procedures of paragraphs (d)(2) (iv) through (vii) of this section may be performed. The oil and water temperatures are defined as stabilized if they are maintained within 2 percent of point for 2 minutes.

(3) *Diesel-fueled engines.* (i) If the engine is cold, start and operate at free idle for 2 to 3 minutes.

(ii) Operate the engine at approximately 50 percent power at the peak torque speed for 5 to 7 minutes.

(iii) Operate the engine at rated speed and wide open throttle for 25 to 30 minutes.

(iv) *Option.* The engine may be preconditioned by operating at rated speed and maximum horsepower until the oil and water temperatures are stabilized. The temperatures are defined as stabilized if they are maintained within 2 percent of point for 2 minutes. This optional procedure may be substituted for paragraph (d)(3)(iii) of this section.

(v) Unload the engine and operate at the curb idle speed.

(vi) Operate the engine at wide open throttle and minimum engine speed. Increase the engine speed at an average rate of 8 rpm/second (±1 rpm/second) from minimum to maximum speed. Engine speed and torque points shall be recorded at a sample rate of at least one point per second.

(vii) Recalculate the maximum speed per paragraph (c)(2) (i) or (ii) of this section using the measured rated speed derived from the new maximum torque curve. If the new maximum speed lies outside the range of speeds encompassed by the actual map, then the map shall be considered void. The entire mapping procedure shall be repeated, using the newly derived measured rated speed in all calculations.

(viii) For warm engines, the entire warm-up procedure specified in paragraphs (d)(3) (i) through (iv) of this section need not be repeated. It is sufficient for an engine already at normal operating temperatures to be operated per the requirements of paragraph (d)(3)(iv) of this section, after which the procedures of paragraphs (d)(3) (v) and (vi) of this section may be performed.

(e) *Mapping curve generation*—(1) *Gasoline-fueled engines.* (i) Fit all data points recorded under paragraphs (d)(2) (vi) and (vii) of this section (100 rpm increments) with a cubic spline, Akima, or other technique approved in advance by the Administrator. The resultant curve shall be accurate to within ± 1.0 ft-lbs. of all recorded engine torques.

(ii) All points generated under the continuous rpm sweep by paragraphs (d)(2) (vi) and (viii) of this section shall be connected by linear interpolation between points.

(iii) For governed engines, all points above the maximum speed (see paragraph (c)(1)(ii) of this section) shall be assigned maximum torque values of zero for purposes of cycle generation.

(iv) For all engines, all speed points below the minimum speed shall be assigned a maximum torque value equal to that observed at minimum speed for purposes of cycle generation.

(v) The torque curve resulting from paragraphs (e)(1) (i) through (iv) of this section is the mapping curve and will be used to convert the normalized torque values in the engine cycle (see Appendix I(f)(1) to this part) to actual torque values for the test cycle.

(2) *Diesel-fueled engines.* (i) Connect all data points recorded under paragraph (d)(3(vi) of this section using linear interpolation between points.

(ii) For governed engines, all points above the maximum speed (see paragraph (c)(2)(ii) of this section) shall be assigned maximum torque values of zero for purposes of cycle generation.

(iii) For all engines, all speed points below the minimum speed shall be assigned a maximum torque value equal to that observed at the minimum speed for purposes of cycle generation.

(iv) The torque curve resulting from paragraphs (e)(2)(i) through (e)(2)(iii) of this section is the mapping curve and will be used to convert the normalized torque values in the engine cycle (see Appendix I(f)(2) to this part) into actual torque value for the test cycle.

(f) *Alternate mapping.* If a manufacturer believes that the above mapping techniques are unsafe or unrepresentative for any given engine or engine family, alternate mapping techniques may be used. These alternate techniques must satisfy the intent of the specified mapping procedures to determine the maximum available torque at all engine speeds achieved during the test cycles. Deviations from the mapping techniques specified in this section for reasons of safety or representativeness shall be reported per § 86.1344-84(e)(6), along with the justification for their use. In no case, however, shall descending continual sweeps of rpm be used for governed or turbocharged engines.

(g) *Replicate Tests.* An engine need not be mapped before each and every cold cycle test. An engine shall be remapped prior to a cold cycle test if:

(1) An unreasonable amount of time has transpired since the last map, as determined by engineering judgment, or

(2) The barometric pressure prior to the start of the cold cycle test has changed more than 1 inch Hg from the average barometric pressure observed during the map, or

(3) Physical changes or recalibrations have been made to the engine which may potentially affect engine performance.

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[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48145, Dec. 10, 1984; 52 FR 47872, Dec. 16, 1987]

§ 86.1332-90 Engine mapping procedures.

(a) Mount test engine on the engine dynamometer.

(b) Determine minimum mapping speed. The minimum speed is defined as the warm engine curb idle rpm.

(c) Determine maximum mapping speed per the following methodologies. (Note paragraph (d)(1) below.)

(1) *Gasoline-fueled and methanol-fueled Otto-cycle engines.* (i) For ungoverned engines using the transient operating cycle set forth in paragraph (f)(1) of Appendix I to this part, the maximum mapping speed shall be no less than that calculated from the following equation:

$$\text{Maximum speed} = \text{curb idle rpm} + \frac{105\ (\text{measured rated rpm} - \text{curb idle rpm})}{100}$$

or when a 3.0 percent drop in maximum horsepower occurs, whichever of the two is greater

(ii) For ungoverned engines using the transient operating cycle set forth in paragraph (f)(3) of Appendix I to this part, the maximum mapping shall be no less than that calculated from the following equation:

$$\text{Maximum speed} = \text{curb idle rpm} + \frac{115\ (\text{measured rated rpm} - \text{curb idle rpm})}{100}$$

or when a 3.0 percent drop in maximum horsepower occurs, whichever of the two is greater

(iii) For governed engines the maximum mapped speed shall be no less than either that speed at which the wide-open throttle torque drops off to zero, or the maximum speed as calculated for ungoverned engines (paragraph (c)(1)(i) of this section)

(2) *Petroleum-fueled and methanol-fueled diesel engines.* (i) For ungoverned engines, the maximum mapping speed shall be no less than that calculated from the following equation:

$$\text{Maximum speed} = \text{curb idle rpm} + \frac{113\ (\text{measured rated rpm} - \text{curb idle rpm})}{100}$$

or when a 3.0 drop in horsepower occurs, whichever of the two is greater

(ii) For governed engines, the maximum mapping speed shall be no less than either that speed at which wide-open throttle torque drops off to zero, or the maximum speed as calculated for ungoverned engines (paragraph (c)(2)(i) of this section).

(d) Perform an engine power map.

(1) During engine preparation or warm-up, the engine may be operated such that a preliminary estimate of measured rated rpm can be made.

(2) *Gasoline-fueled and methanol-fueled Otto-cycle engines.* (i) For a cold engine, start the engine and operate at zero load in accordance with the manufacturer's start-up and warm-up procedures for 1 minute ±30 seconds.

(ii) Operate the engine at a torque equivalent to 10±3 percent of the most recent determination of maximum torque for 4 minutes ±30 seconds at 2000 rpm.

(iii) Operate the engine at a torque equivalent to 55±5 percent of the most recent determination of maximum torque for 35 minutes ±1 minute at 2000 rpm.

(iv) Operate the engine at idle (minimum speed).

(v) Open the throttle fully.

(vi) While maintaining wide-open throttle and full-load, maintain minimum engine speed for at least 15 seconds. Record the average torque during the last 5 seconds.

(vii) In no greater than 100±20 rpm increments, determine the maximum torque curve from minimum speed to maximum speed. Hold each test point for 15 seconds, and record the average torque over the last 5 seconds.

(viii) *Alternate mapping technique.* In place of paragraphs (d)(2) (vi) and (vii) of this section, a continual sweep of rpm is allowed. While operating at wide-open throttle, the engine speed is increased at an average rate of 8 rpm/sec (±1 rpm/sec) from minimum speed to maximum speed. Speed and torque points shall be recorded at a sample rate of at least one point per second.

(ix) Recalculate the maximum speed per paragraph (c)(1) (i) or (ii) of this section using the measured rated speed derived from the new maximum torque curve. If the new maximum speed lies outside the range of speeds encompassed by the actual map, then the map shall be considered void, and another map will need to be run using the newly derived measured rated speed in all calculations.

(x) For warm engines, the entire warm-up procedure specified in paragraphs (d)(2) (i) through (iii) of this section need not be repeated. It is sufficient for an engine already at normal operating temperatures to be operated at the conditions specified in paragraph (d)(2)(iii) of this section until oil and water temperatures are stabilized, after which the procedures of paragraph (d)(2) (iv) through (vii) of this section may be performed. The oil and water temperatures are defined as stabilized if they are maintained within 2 percent of point for 2 minutes.

(3) *Petroleum-fueled and methanol-fueled diesel engines.* (i) If the engine is cold, start and operate at free idle for 2 to 3 minutes.

(ii) Operate the engine at approximately 50 percent power at the peak torque speed for 5 to 7 minutes.

(iii) Operate the engine at rated speed and wide-open throttle for 25 to 30 minutes.

(iv) *Option.* The engine may be preconditioned by operating at rated speed and maximum horsepower until the oil and water temperatures are stabilized. The temperatures are defined as stabilized if they are maintained within 2 percent of point for 2 minutes. This optional procedure may be substituted for paragraph (d)(3)(iii) of this section.

(v) Unload the engine and operate at the curb idle speed.

(vi) Operate the engine at wide open throttle and minimum engine speed. Increase the engine speed at an average rate of 8 rpm/sec (±1 rpm/sec) from minimum to maximum speed. Engine speed and torque points shall be recorded at a sample rate of at least one point per second.

(vii) Recalculate the maximum speed per paragraph (c)(2) (i) or (ii) of this section using the measured rated speed derived from the new maximum torque curve. If the new maximum speed lies outside the range of speeds encompassed by the actual map, then the map shall be considered void. The entire mapping procedure shall be repeated, using the newly derived measured rated speed in all calculations.

(viii) For warm engines, the entire warm-up procedure specified in paragraphs (d)(3) (i) through (iv) of this section need not be repeated. It is sufficient for an engine already at normal operating temperatures to be operated per the requirements of paragraph (d)(3)(iv) of this section, after which the procedures of paragraph (d)(3) (v) through (vi) of this section may be performed.

(e) Mapping curve generation.

(1) *Gasoline-fueled and methanol-fueled Otto-cycle engines.* (i) Fit all data points recorded under paragraphs (d)(2) (vi) and (vii) of this section (100 rpm increments) with a cubic spline, Akima, or other technique approved in advance by the Administrator. The resultant curve shall be accurate to

within ±1.0 ft-lbs of all recorded engine torques.

(ii) All points generated under the continuous rpm sweep by paragraphs (d)(2) (vi) and (viii) of this section shall be connected by linear interpolation between points.

(iii) For governed engines, all points above the maximum speed (see paragraph (c)(1)(ii) of this section) shall be assigned maximum torque values of zero for purposes of cycle generation.

(iv) For all engines, all speed points below the minimum speed shall be assigned a maximum torque value equal to that observed at minimum speed for purposes of cycle generation.

(v) The torque curve resulting from paragraphs (e)(1) (i) through (iv) of this section is the mapping curve and will be used to convert the normalized torque values in the engine cycle (*see* paragraph (f)(1) of Appendix I to this part) to actual torque values for the test cycle.

(2) *Petroleum-fueled and methanol-fueled diesel engines.* (i) Connect all data points recorded under paragraph (d)(3)(vi) of this section using linear interpolation between points.

(ii) For governed engines, all points above the maximum speed (*see* paragraph (c)(2)(ii) of this section) shall be assigned maximum torque values of zero for purposes of cycle generation.

(iii) For all engines, all speed points below the minimum speed shall be assigned a maximum torque value equal to that observed at the minimum speed for purposes of cycle generation.

(iv) The torque curve resulting from paragraphs (e)(2) (i) through (iii) of this section is the mapping curve and will be used to convert the normalized torque values in the engine cycle (*see* paragraph (f)(2) of Appendix I to this part) into actual torque values for the test cycle.

(f) *Alternate mapping.* If a manufacturer believes that the above mapping techniques are unsafe or unrepresentative for any given engine or engine family, alternate mapping techniques may be used. These alternate techniques must satisfy the intent of the specified mapping procedures to determine the maximum available torque at all engine speeds achieved during the test cycles. Deviations from the mapping techniques specified in this section for reasons of safety or representativeness shall be reported per § 86.1344(e)(6), along with the justification for their use. In no case, however, shall descending continual sweeps of rpm be used for governed or turbocharged engines.

(g) *Replicate Tests.* An engine need not be mapped before each and every cold cycle test. An engine shall be remapped prior to a cold cycle test if:

(1) An unreasonable amount of time has transpired since the last map, as determined by engineering judgment, or

(2) The barometric pressure prior to the start of the cold cycle test has changed more than 1 in hg. from the average barometric pressure observed during the map, or

(3) Physical changes or recalibrations have been made to the engine which may potentially affect engine performance.

[54 FR 14597, Apr. 11, 1989]

§ 86.1333-84 Transient test cycle generation.

(a) The heavy-duty transient engine cycles for gasoline-and diesel-fueled engines are listed in Appendix I ((f)(1), (2), and (3) to this part). These second-by-second listings represent torque and rpm maneuvers characteristic of heavy-duty engines. Both rpm and torque are normalized (expressed as a percentage of maximum) in these listings.

(1) To unnormalize rpm use the following equation:

$$\text{Actual rpm} = \frac{\%\ \text{rpm (Measured rated rpm} - \text{curb idle rpm)}}{100} + \text{Curb idle rpm}$$

The method of calculating measured rated rpm is detailed in paragraph (g) of this section.

(2) Torque is normalized to the maximum torque at the rpm listed with it. Therefore, to unnormalize the torque values in the cycle, the maximum torque curve for the engine in question must be used. The generation of the maximum torque curve is described in § 86.1332–84.

(3) The EPA Engine Dynamometer Schedule for Heavy Duty Diesel Engines listed in Appendix I (f)(2) contains torque points referred to as "closed rack motoring." For reference cycle calculation, torque points shall take on unnormalized values determined in either of the following three ways:

(i) Negative 40 percent of the positive torque available at the associated speed point. The generation of this positive maximum torque curve is described in § 86.1332–84.

(ii) Map the amount of negative torque required to motor the engine between idle and maximum mapping speed and use this map to determine the amount of negative torque required at the associated speed point.

(iii) Determine the amount of negative torque required to motor the engine at idle and rated speeds and linearly interpolate using these two points.

(b) *Example of unnormalization procedure.* The following test point shall be normalized:

Percent RPM/43

Percent torque/82

Given the following values:
Measured Rated rpm = 3800
Curb Idle rpm = 600
Calculate actual rpm:

$$\text{Actual rpm} = \frac{\%\ \text{rpm (measured rated rpm} - \text{curb idle rpm)}}{100 + \text{curb idle rpm}}$$

Actual rpm = 43 (3800 − 600)/100 + 600

Actual rpm = 1976

Determine actual torque. Determine the maximum observed torque at 1976 rpm from the maximum torque curve. Then multiply this value (e.g. 358 ft-lbs) by 0.82. This results in an actual torque of 294 ft-lbs.

(c) Engine speed and torque shall be recorded at least once every second during the cold start test and hot start test. The torque and rpm feedback signals may be electronically filtered.

(d) *Cold Start Enhancement Devices.* The zero percent speed specified in the engine dynamometer schedules (Appendix I (f)(1), (f)(2), or (f)(3) to this part) shall be superseded by proper operation of the engine's automatic cold start enhancement device.

(1) During automatic cold start enhancement device operation a manual transmission engine shall be allowed to idle at whatever speed is required to produce a feedback torque of 0 ft-lbs. ±10 ft-lbs. (using, for example, clutch disengagement, speed to torque control switching, software overrides, etc.) at those points in Appendix I (f)(1), (f)(2), or (f)(3) to this part where both reference speed and reference torque are zero percent values.

(2) During automatic cold start enhancement device operation an automatic transmission engine shall be allowed to idle at whatever speed is required to produce a feedback torque of CITT ft-lbs. ±10 ft-lbs. (see (e)(2) of this section for definition of CITT) at those points in Appendix I (f)(1), (f)(2), or (f)(3) to this part where both reference speed and reference torque are zero percent values.

(3) For gasoline engines tested without an operating clutch, modification to the cycle validation criteria for this automatic cold start enhancement device high idle allowance is permitted only for the first 150 seconds of the cold cycle and the first 30 seconds of the hot cycle. After this, the cycles shall be run as specified in Appendix I (f)(1) or (f)(3) to this part. (See § 86.1341–84 for allowances in the cycle validation criteria.)

(4) For diesel engines tested without an operating clutch, modification to the cycle validation criteria for this automatic cold start enhancement device high idle allowance is permitted only for up to the first 180 seconds of the cold cycle or up to the first 30 seconds of the hot cycle. However, the sum of the seconds deleted from the

cold cycle plus the sum of the seconds deleted from the hot cycle may not exceed 180 seconds. After this, the cycles shall be run as specified in Appendix I(f)(2) to this part. (See § 86.1341-84 for allowances in the cycle validation criteria.)

(e) *Automatic Transmissions.* The reference cycles in Appendix I(f) (1) and (2) to this part shall be altered for test engines intended primarily for use with automatic transmissions.

(1) Zero percent speed for automatic transmission engines is defined as curb idle rpm (i.e., in-vehicle, coupled with automatic transmission in gear).

(2) All zero-percent speed, zero-percent torque points (idle points) shall be modified to zero percent speed, x percent torque except as permitted in § 86.1337-84(a)(8). Using the manufacturer's specified curb idle transmission torque (CITT), the maximum torque available at the curb idle (i.e., with transmission) rpm as determined from the maximum torque curve generated in § 86.1332-84, x percent torque is defined per the following equation:

$$x\% = \frac{\text{CITT} \times 100}{\text{Maximum torque at curb idle rpm}}$$

The manufacturer's specified CITT shall be based upon those observed in typical applications.

(f) *Clutch operation.* Manual transmission engines may be tested with a clutch. If used, the clutch shall be disengaged at all zero percent speeds, zero percent torque points, but may be engaged up to two points preceding a non-zero point, and may be engaged for time segments with zero percent speed and torque points of durations less than four seconds. (See § 86.1341-84 for allowances in the cycle validation criteria.)

(g) *Measured rated rpm.* The measured rated rpm corresponds to the 100 percent rpm values specified in the reference cycles of Appendix I(f) (1) and (2) to this part. It is generally intended to represent the rpm at which maximum brake horsepower occurs. For the purposes of this test sequence, it shall either be defined as the manufacturer's specified rated speed, or calculated in the following way, whichever yields the higher speed:

(1) From the maximum torque curve generated per § 86.1332-84, find the maximum observed brake horsepower of the engine.

(2) Calculate 98 percent of the observed maximum brake horsepower, and determine from the maximum torque curve the highest and lowest engine rpms at which this brake horsepower is observed.

(3) The highest and lowest of the 98 percent power rpms represent the endpoints of an rpm range. The midpoint of this range shall be considered the measured rated rpm for cycle generation purposes.

[48 FR 52210, Nov. 16, 1983, as amended at 52 FR 47873, Dec. 16, 1987]

§ 86.1333-90 Transient test cycle generation.

(a) The heavy-duty transient engine cycles for Otto-cycle and diesel engines are listed in Appendix I ((f) (1), (2) and (3)) to this part. These second-by-second listings represent torque and rpm maneuvers characteristic of heavy-duty engines. Both rpm and torque are normalized (expressed as a percentage of maximum) in these listings.

(1) To unnormalize rpm, use the following equation:

$$\text{Actual rpm} = \frac{\%\ \text{rpm (Measured rated rpm} - \text{Curb idle rpm)}}{100} + \text{Curb idle rpm}$$

The method of calculating measured rated rpm is detailed in paragraph (g) of this section.

(2) Torque is normalized to the maximum torque at the rpm listed with it. Therefore, to unnormalize the torque values in the cycle, the maximum torque curve for the engine in question must be used. The generation of the maximum torque curve is described in § 86.1332.

(3) The EPA Engine Dynamometer Schedule for Heavy Duty Diesel Engines listed in Appendix I (f)(2) contains torque points referred to as "closed rack motoring." For reference cycle calculation torque points shall take on unnormalized values determined in either of the following three ways:

(i) Negative 40 percent of the positive torque available at the associated speed point. The generation of this positive maximum torque curve is described in § 86.1332.

(ii) Map the amount of negative torque required to motor the engine between idle and maximum mapping speed and use this map to determine the amount of negative torque required at the associated speed point.

(iii) Determine the amount of negative torque required to motor the engine at idle and rated speeds and linearly interpolate using these two points.

(b) *Example of the unnormalization procedure.* The following test point shall be unnormalized:

Percent RPM	Percent Torque
43	82

Given the following values:

Measured Rated rpm = 3800.

Curb Idle rpm = 600.

(1) *Calculate actual rpm:*

$$\text{Actual rpm} = \frac{\%\ \text{rpm (measured rated rpm} - \text{curb idle rpm)}}{100} + \text{curb idle rpm}$$

$$= \frac{43\ (3800 - 600)}{100} + 600$$

$$= \frac{43\ (3800—600)}{1976} + 600$$

(2) *Determine actual torque:* Determine the maximum observed torque at 1976 rpm from the maximum torque curve. Then multiply this value (*e.g.,* 358 ft-lbs) by 0.82. This results in an actual torque of 294 ft-lbs.

(c) Engine speed and torque shall be recorded at least once every second during the cold start test and hot start test. The torque and rpm feedback signals may be electronically filtered.

(d) *Cold start enhancement devices.* The zero percent speed specified in the engine dynamometer schedules (Appendix I, (f)(1), (f)(2) or (f)(3) to this part) shall be superseded by proper operation of the engine's automatic cold start enhancement device.

(1) During automatic cold start enhancement device operation a manual transmission engine shall be allowed to idle at whatever speed is reguired to produce a feedback torque of 0 ft-lbs ± 10 ft-lbs (using, for example, clutch disengagement, speed to torque control switching, software overrides, etc. at those points in Appendix I, (f)(1), (f)(2) or (f)(3) to this part where both reference speed and reference torque are zero percent values.

(2) During automatic cold start enhancement device operation an automatic transmission engine shall be allowed to idle at whatever speed is required to produce a feedback torque of CITT ft-lbs ± 10 ft-lbs (see (e)(2) of this section for definition of CITT) at those points in Appendix I (f)(1), (f)(2) or (f)(3) to this part where both refer-

ence speed and reference torque are zero percent values.

(3) For Otto-cycle engines tested without an operating clutch, modification to the cycle validation criteria for this automatic cold start enhancement device high idle allowance is permitted only for the first 150 seconds of the cold cycle and the first 30 seconds of the hot cycle. After this, the cycles shall be run as specified in Appendix I (f)(1) or (f)(3) to this part. (*See* § 86.1341-90 for allowances in the cycle validation criteria.)

(4) For diesel engines tested without an operating clutch, modification to the cycle validation criteria for this automatic cold start enhancement device high idle allowance is permitted only for up to the first 180 seconds of the cold cycle or up to the first 30 seconds of the hot cycle. However, the sum of the seconds deleted from the cold cycle plus the sum of the seconds deleted from the hot cycle may not exceed 180 seconds. After this, the cycles shall be run as specified in Appendix I (f)(2) to this part. (See 86.1341 for allowances in the cycle validation criteria.)

(e) *Automatic transmissions.* The reference cycles in paragraphs (f) (1) and (2) of Appendix I to this part shall be altered for test engines intended primarily for use with automatic transmissions.

(1) Zero percent speed for automatic transmission engines is defined as curb idle rpm (*i.e.*, in-vehicle, coupled with automatic transmission in gear).

(2) All zero-percent speed, zero-percent torque points (idle points) shall be modified to zero percent speed, x percent torque, except as permitted in § 86.1337(a)(8). Using the manufacturers' specified curb idle transmission torque (CITT), the maximum torque available at the curb idle (*i.e.*, with transmission) rpm as determined from the maximum torque curve generated in § 86.1332, x percent torque is defined per the following equation:

$$x\% = \frac{\text{CITT} \times 100}{\text{Maximum torque at curb idle rpm}}$$

The manufacturer's specified CITT shall be based upon those observed in typical applications.

(f) *Clutch operation.* Manual transmission engines may be tested with a clutch. If used, the clutch shall be disengaged at all zero percent speeds, zero percent torque points, but may be engaged up to two points preceeding a non-zero point, and may be engaged for time segments with zero percent speed and torque points of durations less than four seconds. (*See* § 86.1341 for allowances in the cycle validation criteria.)

(g) *Measured rated rpm.* The measured rated rpm corresponds to the 100 percent rpm values specified in the reference cycles (paragraphs (f) (1) and (2) of Appendix I to this part). It is generally intended to represent the rpm at which maximum brake horsepower occurs. For the purposes of this test sequence, it shall either be defined as the manufacturer's specified rated speed, or calculated in the following way, whichever yields the higher speed:

(1) From the maximum torque curve generated per § 86.1332, find the maximum observed brake horsepower of the engine.

(2) Calculate 98 percent of the observed maximum brake horsepower, and determine from the maximum torque curve the highest and lowest engine rpms at which this brake horsepower is observed.

(3) The highest and lowest of the 98 percent power rpms represent the endpoints of an rpm range. The midpoint of this range shall be considered the measured rated rpm for cycle generation purposes.

[54 FR 14599, Apr. 11, 1989]

§ 86.1334–84 Pre-test engine and dynamometer preparation.

(a) *Control system calibration.* (1) Before the cold soak or cool down, final calibration of the dynamometer and throttle control systems may be performed. These calibrations may consist of steady-state operations and/or actual practice cycle runs.

(2) Following any practice runs or calibration procedures, the engine shall be turned off and allowed to soak

at normal ambient conditions until the oil sump reaches a temperature between 68 °F and 86 °F (20 °C to 30 °C) for a minimum of 0.5 hr., or be cooled per § 86.1335-84.

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[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48145, Dec. 10, 1984; 52 FR 47874, Dec. 16, 1987]

§ 86.1335–84 Optional forced cool-down procedure.

(a) This forced cool-down procedure applies to both gasoline and diesel-fueled engines.

(b) No substances or fluids may be applied to the engine's internal or external surfaces except for water and air as prescribed in paragraphs (c) and (d) of this section.

(c) For water-cooled engines two types of cooling are permitted.

(1) Water may be circulated through the engine's water coolant system.

(i) The cooling water may be flowed in either direction and at any desired flow rate. The thermostat may be removed or blocked open during the cool-down but must be restored before the exhaust emissions test begins.

(ii) The temperature of the circulated or injected water shall be at least 10° C (50° F). In addition, the temperature of the cooling water shall not exceed 30° C (86° F) during the last 30 minutes of the forced cool-down.

(iii) Only water, including the use of a building's standard water supply, or the coolant that is already in the engine (per § 86.1327-84(e)) is permitted for forced cool-down purposes.

(2) Flows of air may be directed at the exterior of the engine.

(i) The air shall be directed essentially uniformly over the exterior surface of the engine at any desired flow rate.

(ii) The temperature of the cooling air shall not exceed 30° C (86° F) during the last 30 minutes of the cool down, but may be less than 20° C (68° F) at any time.

(d) For air-cooled engines only cooling as prescribed in paragraph (c)(2) of this section is permitted.

(e)(1) The cold cycle exhaust emission test may begin after a forced cool down only when the engine oil temperature is stabilized between 68 °F and 75 °F (20 °C and 24 °C) for a minimum of 10 minutes.

(i) This temperature measurement is to be made by a temperature measurement device immersed in the sump oil, the sensor part of which is not in contact with any engine surface.

(ii) The forced cool down apparatus shall be shut off during this measurement. No engine oil change is permitted during the test sequence.

(2) Direct forced cooling of the engine oil through the use of oil coolers or heat exchangers is permitted but the cold cycle emission test may begin only when the circulating water temperature has stabilized to within 2.8° C (5° F) of the stabilized oil temperature.

(3) Any other means for the direct forced cooling of the engine oil must be approved in advance by the Administrator.

(f)(1) The cold cycle exhaust emission test for gasoline engines equipped with catalytic converters may begin after a forced cool down only when the catalyst bed temperature at the catalyst outlet is 25° C ±5° C (77° F ±9° F), in addition to the temperature restrictions in paragraph (e) of this section.

(2) Catalyst cool down may be accomplished in whatever manner and using whatever coolant deemed appropriate by proper engineering judgment. The catalyst, engine, and exhaust piping configurations shall not be separated, altered, or moved in any way during the cool down.

(g) At the completion of the forced cool down, all general requirements specified in § 86.1330-84, the oil temperature specification set forth in paragraph (e) of this section, and the catalyst temperature specifications in paragraph (f) of this section must be met before the cold cycle exhaust emission test may begin.

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[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48145, Dec. 10, 1984; 52 FR 47874, Dec. 16, 1987]

§ 86.1335-90 Optional forced cool-down procedure.

(a) This forced cool-down procedure applies to Otto-cycle and diesel engines.

(b) No substances or fluids may be applied to the engine's internal or external surfaces except for water and air as prescribed in paragraphs (c) and (d) of this section.

(c) For water-cooled engines two types of cooling are permitted:

(1) Water may be circulated through the engine's water coolant system.

(i) The cooling water may be flowed in either direction and at any desired flow rate. The thermostat may be removed or blocked open during the cool-down but must be restored before the exhaust emissions test begins.

(ii) The temperature of the circulated or injected water shall be at least 10 °C (50 °F). In addition, the temperature of the cooling water shall not exceed 30 °C (86 °F) during the last 30 minutes of the forced cool-down.

(iii) Only water, including the use of a building's standard water supply, or the coolant that is already in the engine (per § 86.1327(e)) is permitted for forced cool-down purposes.

(2) Flows of air may be directed at the exterior of the engine.

(i) The air shall be directed essentially uniformly over the exterior surface of the engine at any desired flow rate.

(ii) The temperature of the cooling air shall not exceed 86 °F (30 °C) during the last 30 minutes of the cool-down, but may be less than 68 °F (20 °C) at any time.

(d) For air-cooled engines, only cooling as prescribed in paragraph (c)(2) of this section is permitted.

(e)(1) The cold cycle exhaust emission test may begin after a forced cool-down only when the engine oil temperature is stabilized between 68 °F and 75 °F (20 °C and 24 °C) for a minimum of ten minutes.

(i) This temperature measurement is to be made by a temperature measurement device immersed in the sump oil, the sensor part of which is not in contact with any engine surface.

(ii) The forced cool-down apparatus shall be shut off during this measurement. No engine oil change is permitted during the test sequence.

(2) Direct forced cooling of engine oil through the use of oil coolers or heat exchangers is permitted, but the cold cycle emission test may begin only when the circulating water temperature has stabilized to within 5 °F (2.8 °C) of the stabilized oil temperature.

(3) Any other means for the direct forced cooling of the engine oil must be approved in advance by the Administrator.

(f)(1) The cold cycle exhaust emission test for engines equipped with catalytic converters may begin after a forced cool-down only when the catalyst bed temperature at the catalyst outlet is 77 °F±9 °F (25 °C±5 °C), in addition to the temperature restrictions in paragraph (e) of this section.

(2) Catalyst cool-down may be accomplished in whatever manner and using whatever coolant deemed appropriate by proper engineering judgment. The catalyst, engine, and exhaust piping configurations shall not be separated, altered, or moved in any way during the cool-down.

(g) At the completion of the forced cool-down all of the general requirements specified in § 86.1330, the oil temperature specification set forth in paragraph (e) of this section, and the catalyst temperature specifications in paragraph (f) of this section must be met before the cold cycle exhaust emission test may begin.

[54 FR 14600, Apr. 11, 1989]

§ 86.1336-84 Engine starting, restarting, and shutdown.

(a) The engine shall be started according to the manufacturer's recommended starting procedure in the owner's manual, using either a production starter motor or the dynamometer. The speed at which the engine is cranked (motored) with the dynamometer shall be equal to the cranking speed (nominal speed ±10 percent) in the vehicle with a fully charged battery. The time taken to accelerate the engine to cranking speed by the dynamometer shall be equal (nominal ±0.5 seconds) to the time required with a starter motor. Motoring by the dynamometer shall be terminated not more than one second after the engine starts. The 24 ±1-second free idle period, and declutching if applicable, shall begin when the engine is determined to have started.

(1) Engines equipped with automatic chokes shall be operated according to the manufacturer's operating instructions in the owner's manual, including choke setting and "kick-down" from cold fast idle.

(2) Engines equipped with manual chokes shall be operated according to the manufacturer's operating instructions in the owner's manual.

(3) The operator may use the choke, throttle, etc. where necessary to keep the engine running.

(4) If the manufacturer's operating instructions in the owner's manual do not specify a warm engine starting procedure, the engine (automatic and manual choke engines) shall be started by depressing the throttle half way and cranking the engine until it starts.

(b)(1) If the engine does not start after 15 seconds of cranking, cranking shall cease and the reason for failure to start shall be determined. The gas flow measuring device (or revolution counter) on the constant volume sampler (and the hydrocarbon integrator when testing diesel-fueled engines) shall be turned off during this diagnostic period. In addition, either the CVS should be turned off or the exhaust tube disconnected from the tailpipe during the diagnostic period. If failure to start is an operational error, the engine shall be rescheduled for testing from a cold start.

(2) If longer cranking times are necessary and recommended to the ultimate purchaser, such cranking times may be used in lieu of the 15-second limit, provided the owner's manual and the service repair manual indicate that the longer cranking times are normal.

(3) If a failure to start occurs during the cold portion of the test and is caused by an engine malfunction, corrective action of less than 30 minutes duration may be taken (according to § 86.084-25), and the test continued. The sampling system shall be reactivated at the same time cranking begins. When the engine starts, the timing sequence shall begin. If failure to start is caused by engine malfunction and the engine cannot be started, the test shall be voided and corrective action may be taken according to § 86.084-25.

(4) If a failure to start occurs during the hot start portion of the test and is caused by engine malfunction, the engine must be started within one minute of key on. The sampling system shall be reactivated at the same time cranking begins. When the engine starts, the transient engine cycle timing sequence shall begin. If the engine cannot be started within one minute of key on, the test shall be voided, corrective action taken (according to § 86.084-25), and the engine rescheduled for testing.

(c) *Engine stalling.* (1) If the engine stalls during the initial idle period of either the cold or hot start test, the engine shall be restarted immediately using the appropriate cold or hot starting procedure and the test continued.

(2) If the engine stalls anywhere in the cold cycle, except in the initial idle period, the test shall be voided.

(3) If the engine stalls on the hot cycle portion of the test at any time other than the initial idle, the engine may be shut off and resoaked for 20 minutes. The hot cycle may then be rerun. Only one hot start resoak and restart is permitted.

(d) *Engine shutdown.* Engine shutdown shall be performed in accordance with manufacturer's specifications.

(e) *Test equipment malfunction.* (1) If a malfunction occurs in any of the required test equipment during the cold cycle portion of the test, the test shall be voided.

(2) If a malfunction occurs in any of the required test equipment (computer, gaseous emissions analyzer, etc.) during the hot cycle portion of the test, complete the full engine cycle before engine shut-down then resoak for 20 minutes.

(i) If the test equipment malfunction can be corrected before the resoak period has been completed the hot cycle portion of the test may be rerun.

(ii)(*A*) If the test equipment malfunction is corrected after the completion of the resoak period, then a preconditioning cycle must be run before the hot cycle. This consists of a full 20 minute transient cycle followed by a 20 minute soak and then the for-record hot cycle.

(*B*) In no case can the start of the cold cycle and the start of the hot cycle be separated by more than 4 hours.

(Approved by the Office of Management and Budget under control number 2000-0390)

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48145, Dec. 10, 1984; 50 FR 10694, Mar. 15, 1985; 52 FR 47874, Dec. 16, 1987]

§ 86.1337-84 Engine dynamometer test run.

(a) The following steps shall be taken for each test:

(1) Prepare the engine, dynamometer, and sampling system for the cold start test. Change filters, etc. and leak check as necessary.

(2) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(3) Attach the CVS to the engine exhaust system any time prior to starting the CVS.

(4) Start the CVS (if not already on), the sample pumps, the engine cooling fan(s) and the data collection system. The heat exchanger of the constant volume sampler (if used) and the heated components of any continuous sampling systems(s) (if applicable) shall be preheated to their designated operating temperatures before the test begins. (See § 86.1340-84(e) for continuous sampling procedures.)

(5) Adjust the sample flow rates to the desired flow rates and set the CVS gas flow measuring devices to zero.

NOTE: CFV-CVS sample flow rate is fixed by the venturi design.

(6) Follow the manufacturer's choke and throttle instructions for cold starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For diesel engines, turn on the hydrocarbon, continuous NOx, CO, or CO_2 (if used) analyzer(s) system integrator(s) and indicate the start of the test on the data collection medium (i.e., mark the chart on a chart recorder, set a byte on a computer or data logger, etc.).

(7) As soon as it is determined that the engine is started, start a "free idle" timer.

(8) Allow the engine to idle freely with no-load for 24±1 seconds. This idle period for automatic transmission engines may be interpreted as an idle speed in neutral or park. All other idle conditions shall be interpreted as an idle speed in gear. It is permissible to lug the engine down to curb idle speed during the last 8 seconds of the free idle period for the purpose of engaging dynamometer control loops.

(9) Begin the transient engine cycles such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle time is included in the 25±1 seconds.

(10) On the last record of the cycle immediately turn the engine off and start a hot soak timer. Sampling systems should continue to sample after the end of the test cycle until system response times have elapsed.

(11)(i) Immediately after the engine is turned off, turn off the engine cooling fan(s) if used.

(ii) Turn off the CVS blower or disconnect or otherwise isolate the exhaust system from the CVS.

(iii) As soon as possible, transfer the "cold start cycle" exhaust and dilution air bag samples to the analytical system and process the samples according to § 83.1340-84.

(iv) A stabilized reading of the exhaust sample on all analyzers shall be made within 20 minutes of the end of the sample collection phase of the test.

(12) Allow the engine to soak for 20±1 minutes.

(13) Prepare the engine and dynamometer for the hot start test.

(14) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(15) Start the CVS (if not already on) or connect the exhaust system to the CVS (if disconnected). Start the sample pumps, the engine cooling fan(s) and the data collection system. The heat exchanger of the constant volume sampler (if used) and the

heated components of any continuous sampling system(s) (if applicable) shall be preheated to their designated operating temperatures before the test begins. See § 86.1340-84(e) for continuous sampling procedures.

(16) Adjust the sample flow rates to the desired flow rate and set the CVS gas flow measuring devices to zero.

NOTE: CFV-CVS sample flow rate is fixed by the venturi design.

(17) Follow the manufacturer's choke and throttle instruction for hot starting. Simultaneously start the engine and begin exhaust and dilution air sampling.

(18) As soon as it is determined that the engine is started, start a "free idle" timer.

(19) Allow the engine to idle freely with no-load for 24±1 seconds. The provisions and interpretations of paragraph (a)(8) of this section apply.

(20) Begin the transient engine cycle such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle is included in the 25±1 seconds.

(21) Beginning at the last record of the cycle, allow sampling system response times to elapse and cease sampling.

(22) As soon as possible transfer the "hot start cycle" exhaust and dilution air bag samples to the analytical system and process the samples according to § 86.1340-84. A stabilized reading of the exhaust sample on all analyzers shall be obtained within 20 minutes of the end of the sample collection phase of the test.

(23) The CVS and the engine may be turned off, if desired.

(b) The procedure in paragraph (a) of this section is designed for one sample bag for the cold start portion and one for the hot start portion. It is also permissible to use more than one sample bag per test portion.

(c) If a dynamometer test run is determined to be void, corrective action may be taken. The engine may then be allowed to cool (naturally or forced) and the dynamometer test rerun per paragraph (a) or (b) of this section.

[48 FR 52210, Nov. 16, 1983, as amended at 52 FR 47874, Dec. 16, 1987]

§ 86.1337-88 Engine dynamometer test run.

(a) The following steps shall be taken for each test:

(1) Prepare the engine, dynamometer, and sampling system for the cold-start test. Change filters, etc. and leak check as necessary.

NOTE: For a single dilution particulate system, a propane check will not reveal a pressure side leak (that portion of the system downstream of the pump) since the volume concentration is ppm will not change if a portion of the sample is lost. A separate leak check is needed.

A leak check of a filter assembly that has only one seal ring in contact with the filter media will not detect a leak tested under vacuum. A pressure leak test should be performed.

(2) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(3) Attach the CVS to the engine exhaust system any time prior to starting the CVS.

(4) Start the CVS (if not already on), the sample pumps (except for the diesel particulate sample pump(s), if applicable), the engine cooling fan(s), and the data collection system. The heat exchanger of the constant volume sampler (if used), and the heated components of any continuous sampling system(s) (if applicable) shall be preheated to their designated operating temperatures before the test begins. (See § 86.1340-84(e) for continuous sampling procedures.)

(5) Adjust the sample flow rates to the desired flow rates and set the CVS gas flow measuring devices to zero.

NOTE: CFV-CVS sample flow rate is fixed by the venturi design.

(6) For diesels only, carefully install a clean particulate sample filter into each of the filter holders and install the assembled filter holders in the sample flow line. (Filter holders may be preassembled.)

(7) Follow the manufacturer's choke and throttle instructions for cold starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For diesel engines, turn on the hydrocarbon and NO_x (and CO and CO_2, if continuous) analyzer system integrators (if used) and turn

on the particulate sample pumps and indicate the start of the test on the data collection medium.

(8) As soon as it is determined that the engine is started, start a "free idle" timer.

(9) Allow the engine to idle freely with no-load for 24±1 seconds. This idle period for automatic transmission engines may be interpreted as an idle speed in neutral or park. All other idle conditions shall be interpreted as an idle speed in gear. It is permissible to lug the engine down to curb idle speed during the last 8 seconds of the free idle period for the purpose of engaging dynamometer control loops.

(10) Begin the transient engine cycles such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle time is included in the 25±1 seconds.

(i) During diesel particulate testing without the use of flow compensation, adjust the sample pump(s) so that the flow rate through the particulate sample probe or transfer tube is maintained at a value within ±5 percent of the set flow rate.

(ii) During diesel particulate sampling with the use of flow compensation (i.e. proportional control of sample flow), it must be demonstrated that the ratio of main tunnel flow to particulate sample flow does not change by more than ±5.0 percent of its set point value (except for the first 10 seconds of sampling). Note: for double dilution operation, sample flow is the net difference between the flow rate through the sample filters and the secondary dilution air flow rate.

(iii) Record the average temperature and pressure at the gas meter(s) or flow instrumentation inlet. If the set flow rate cannot be maintained because of high particulate loading on the filter, the test shall be terminated. The test shall be rerun using a lower flow rate and/or a larger diameter filter

(11) On the last record of the cycle, cease sampling. Immediately turn the engine off, and start a hot-soak timer. For diesel engines, also turn off the particulate sample pumps, the gas flow measuring device(s) and any continuous analyzer system integrators and indicate the end of the test on the data collection medium. Sampling systems should continue to sample after the end of the test cycle until system response times have elapsed.

(12) Immediately after the engine is turned off, turn off the engine cooling fan(s) if used, and the CVS blower (or disconnect the exhaust system from the CVS). As soon as possible, transfer the "cold start cycle" exhaust and dilution air bag samples to the analytical system and process the samples according to § 83.1340-84. A stabilized reading of the exhaust sample on all analyzers shall be obtained within 20 minutes of the end of the sample collection phase of the test. For diesel engines, carefully remove the filter holder from the sample flow apparatus, and remove each particulate sample filter from its holder and place each in a petri dish and cover.

(13) Allow the engine to soak for 20±1 minutes.

(14) Prepare the engine and dynamometer for the hot start test.

(15) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(16) Start the CVS (if not already on) or connect the exhaust system to the CVS (if disconnected). Start the sample pumps (except the diesel particulate sample pump(s), if applicable), the engine cooling fan(s) and the data collection system. The heat exchanger of the constant volume sampler (if used) and the heated components of any continuous sampling system(s) (if applicable) shall be preheated to their designated operating temperatures before the test begins. See § 86.1340-84(e) for continuous sampling procedures.

(17) Adjust the sample flow rates to the desired flow rate and set the CVS gas flow measuring devices to zero.

(18) For diesels only, carefully install a clean particulate filter in each of the filter holders and install assembled filter holders in the sample flow line. (Filter holders may be preassembled.)

(19) Follow the manufacturer's choke and throttle instruction for hot starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For diesel engines, turn on the hydrocarbon and NO_x (and CO

and CO_2, if continuous) analyzer system integrators (if used), indicate the start of the test on the data collection medium, and turn on the particulate sample pump(s).

(20) As soon as it is determined that the engine is started, start a "free idle" timer.

(21) Allow the engine to idle freely with no-load for 24±1 seconds. The provisions and interpretations of paragraph (a)(9) of this section apply.

(22) Begin the transient-engine cycle such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle is included in the 25±1 seconds.

(23) On the last record of the cycle, allow sampling system response times to elapse and cease sampling. For diesel engines, turn off the particulate sample pump(s), the gas flow measuring device(s) and any continuous analyzer system integrators and indicate the end of the test on the data collection medium.

(24) As soon as possible, transfer the "hot start cycle" exhaust and dilution air bag samples to the analytical system and process the samples according to § 86.1340-84. A stabilized reading of the exhaust sample on all analyzers shall be obtained within 20 minutes of the end of the sample collection phase of the test. For diesel engines, carefully remove the assembled filter holder from the sample flow lines and remove each particulate sample filter from its holder and place in a clean petri dish and cover as soon as possible. Within 1 hour after the end of the hot start phase of the test, transfer the four particulate filters to the weighing chamber for post-test conditioning.

(25) The CVS and the engine may be turned off, if desired.

(b) The procedure in paragraph (a) of this section is designed for one sample bag for the cold-start protion and one for the hot-start protion. It is also permissible to use more than one sample bag per test portion.

(c) If a dynamometer test run is determined to be void, corrective action may be taken. The engine may then be allowed to cool (naturally or forced) and the dynamometer test rerun per paragraph (a) or (b) of this section.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10704, Mar. 15, 1985, as amended at 52 FR 47874, Dec. 16, 1987]

§ 86.1337-90 Engine dynamometer test run.

(a) The following steps shall be taken for each test:

(1) Prepare the engine, dynamometer, and sampling system for the cold-start test. Change filters, etc., and leak check as necessary.

NOTE: For a single dilution particulate system, a propane check will not reveal a pressure side leak (that portion of the system downstream of the pump) since the volume concentration in ppm will not change if a portion of the sample is lost. A separate leak check is needed.

A leak check of a filter assembly that has only one seal ring in contact with the filter media will not detect a leak when tested under vacuum. A pressure leak test should be performed.

(2) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(3) For methanol-fueled vehicles, install fresh methanol and formaldehyde impingers (or capsules) in the exhaust and dilution air sample systems for methanol and formaldehyde. A single dilution air sample covering the total test period may be utilized for formaldehyde background.

(4) Attach the CVS to the engine exhaust system any time prior to starting the CVS.

(5) Start the CVS (if not already on), the sample pumps (except for the particulate sample pump(s), if applicable), the engine cooling fan(s), and the data collection system. The heat exchanger of the constant volume sampler (if used), and the heated components of any continuous sampling system(s) (if applicable) shall be preheated to their designated operating temperatures before the test begins. (*See* § 86.1340(e) for continuous sampling procedures.)

(6) Adjust the sample flow rates to the desired flow rates and set the CVS gas flow measuring devices to zero.

NOTE: CFV-CVS sample flow rate is fixed by the venturi design.

(7) For petroleum-fueled and methanol-fueled diesel engines, carefully install a clean particulate sample filter into each of the filter holders and install the assembled filter holders in the sample flow line. (Filter holders may be preassembled.)

(8) Follow the manufacturer's choke and throttle instructions for cold starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For petroleum-fueled diesel engines (and methanol-fueled diesels, if used) turn on the hydrocarbon and NO_x (and CO and CO_2, if continuous) analyzer system integrators (if used), and turn on the particulate sample pumps and indicate the start of the test on the data collection medium.

(9) As soon as it is determined that the engine is started, start a "free idle" timer.

(10) Begin the transient engine cycles such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle time is included in the 25±1 seconds.

(i) During diesel particulate testing without the use of flow compensation, adjust the sample pump(s) so that the flow rate through the particulate sample probe or transfer tube is maintained at a value within ±5 percent of the set flow rate.

(ii) During diesel particulate sampling with the use of flow compensation (*i.e.*, proportional control of sample flow), it must be demonstrated that the ratio of main tunnel flow to particulate sample flow does not change by more than ±5.0 percent of its set point value (except for the first 10 seconds of sampling).

NOTE: for double dilution operation, sample flow is the net difference between the flow rate through the sample filters and the secondary dilution air flow rate.

(iii) Record the average temperature and pressure at the gas meter(s) or flow instrumentation inlet. If the set flow rate cannot be maintained because of high particulate loading on the filter, the test shall be terminated. The test shall be rerun using a lower flow rate and/or a larger diameter filter.

(11) Begin the transient engine cycles such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle time is included in the 25±1 seconds. During particulate testing without the use of flow compensation, adjust the sample pump(s) so that the flow rate through the particulate sample probe or transfer tube is maintained at a constant value within ±5 percent of the set flow rate. Record the average temperature and pressure at the gas meter(s) or flow instrumentation inlet. If the set flow rate cannot be maintained because of high particulate loading on the filter, the test shall be terminated. The test shall be rerun using a lower flow rate and/or a larger diameter filter.

(12) On the last record of the cycle, cease sampling. Immediately turn the engine off, and start a hot-soak timer. Also turn off the particulate sample pumps, the gas flow measuring device(s) and any continuous analyzer system integrators and indicate the end of the test on the data collection medium. Sampling systems should continue to sample after the end of the test cycle until system response times have elapsed.

(13) Immediately after the engine is turned off, turn off the engine cooling fan(s) if used, and the CVS blower (or disconnect the exhaust system from the CVS). As soon as possible, transfer the "cold start cycle" exhaust and dilution air bag samples to the analytical system and process the samples according to § 86.1340. A stabilized reading of the exhaust sample on all analyzers shall be obtained within 20 minutes of the end of the sample collection phase of the test. Analysis of the methanol and formaldehyde samples shall be obtained within 24 hours of the end of the sample collection period. For petroleum-fueled and methanol-fueled diesel engines, carefully remove the filter holder from the sample flow apparatus, and remove each particulate sample filter from its holder and place each in a petri dish and cover.

(14) Allow the engine to soak for 20±1 minutes.

(15) Prepare the engine and dynamometer for the hot start test.

(16) Connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(17) Install fresh methanol and formaldehyde impingers (or capsules) in the exhaust and dilution air sample systems for methanol and formaldehyde.

(18) Start the CVS (if not already on) or connect the exhaust system to the CVS (if disconnected). Start the sample pumps (except the particulate sample pump(s), if applicable), the engine cooling fan(s) and the data collection system. The heat exchanger of the constant volume sampler (if used) and the heated components of any continuous sampling system(s) (if applicable) shall be preheated to their designated operating temperatures before the test begins. See § 86.1340(e) for continuous sampling procedures.

(19) Adjust the sample flow rates to the desired flow rate and set the CVS gas flow measuring devices to zero.

(20) For petroleum-fueled and methanol-fueled diesel engines, carefully install a clean particulate filter in each of the filter holders and install assembled filter holders in the sample flow line. (Filter holders may be preassembled.)

(21) Follow the manufacturer's choke and throttle instruction for hot starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For diesel engines, turn on the hydrocarbon and NO_x (and CO and CO_2, if continuous) analyzer system integrators (if used), indicate the start of the test on the data collection medium, and turn on the particulate sample pump(s).

(22) As soon as it is determined that the engine is started, start a "free idle" timer.

(23) Allow the engine to idle freely with no-load for 24±1 seconds. The provisions and interpretations of paragraph (a)(10) of this section apply.

(24) Begin the transient-engine cycle such that the first non-idle record of the cycle occurs at 25±1 seconds. The free idle is included in the 25±1 seconds.

(25) On the last record of the cycle, allow sampling system response times to elapse and cease sampling. Turn off the particulate sample pump(s) (if appropriate), the gas flow measuring device(s) and any continuous analyzer system integrators and indicate the end of the test on the data collection medium.

(26) As soon as possible, transfer the "hot start cycle" exhaust and dilution air bag samples to the analytical system and process the samples according to § 86.1340. A stabilized reading of the exhaust sample on all analyzers shall be obtained within 20 minutes of the end of the sample collection phase of the test. Analyze the methanol and formaldehyde samples within 24 hours. (If it is not possible to perform analysis within 24 hours, the samples should be stored in a cold (approximately 0°C) dark environment until analysis can be performed). For petroleum fueled and methanol-fueled diesel engines, carefully remove the assembled filter holder from the sample flow lines and remove each particulate sample filter from its holder and place in a clean petri dish and cover as soon as possible. Within 1 hour after the end of the hot start phase of the test, transfer the four particulate filters to the weighing chamber for post-test conditioning.

(27) The CVS and the engine may be turned off, if desired.

(b) The procedure in paragraph (a) of this section is designed for one sample bag for the cold start portion and one for the hot start portion. It is also permissible to use more than one sample bag per test portion.

(c) If a dynamometer test run is determined to be void, corrective action may be taken. The engine may then be allowed to cool (naturally or forced) and the dynamometer test rerun per paragraph (a) or (b) of this section.

[54 FR 14600, Apr. 11, 1989]

§ 86.1338–84 Emission measurement accuracy.

(a) *Measurement accuracy—Bag sampling.* (1) Good engineering practice dictates that exhaust emission sample analyzer readings below 15 percent of full scale chart deflection should generally not be used.

(2) Some high resolution read-out systems such as computers, data loggers, etc., can provide sufficient accuracy and resolution below 15 percent of full scale. Such systems may be used provided that additional calibra-

tions are made to ensure the accuracy of the calibration curves. The following procedure for calibration below 15 percent of full scale may be used:

(i) If a 16-point gas divider is used, 50 percent of the calibration points shall be below 10 percent of full scale. The gas divider shall conform to the accuracy requirements specified in § 86.1314-84(g).

(ii) If a 7- or 9-point gas divider is used, the gas divider shall conform to the accuracy requirements specified in § 86.1314-84(g), and shall be used according to the following procedure:

(A) Span the full analyzer range using a top range calibration gas meeting the accuracy requirements of § 86.1314-84(f)(2).

(B) Generate a calibration curve according to, and meeting the requirements of, § 86.1321-84 through § 86.1324-84.

(C) Select a calibration gas (a span gas may be used for calibrating the CO_2 analyzer) with a concentration between the two lowest non-zero gas divider increments. This gas must be "named" to an accuracy of ±1.0 percent (±2.0 percent for CO_2 span gas) of NBS gas standards, or other standards approved by the Administrator.

(D) Using the calibration curve fitted to the points generated in paragraphs (a)(2)(ii) (A) and (B) of this section, check the concentration of the gas selected in paragraph (a)(2)(ii)(C) of this section. The concentration derived from the curve shall be within ±2.3 percent (±2.8 percent for CO_2 span gas) of the gas' original named concentration.

(E) Provided the requirments of paragraph (a)(2)(ii)(D) of this section are met, use the gas divider with the gas selected in paragraph (a)(2)(ii)(C) of this section and determine the remainder of the calibration points. Fit a calibration curve per §§ 86.1321-84 through 86.1324-84 for the entire analyzer range.

(b) *Measurement accuracy—Continuous sampling.* (1) Analyzers used for continuous analysis must be operated such that the measured concentration falls between 15 and 100 percent of full scale chart deflection. Exceptions to these limits are:

(i) The analyzer's response may be less than 15 percent or more than 100 percent of full scale if automatic range change circuitry is used and the limits for range changes are between 15 and 100 percent of full scale chart deflection;

(ii) The analyzer's response may be less than 15 percent of full scale if:

(A) Alternative (a)(2) of this section is used to ensure that the accuracy of the calibration curve is maintained below 15 percent; or

(B) The full scale value of the range is 155 ppm (C) or less; or

(C) The emissions from the engine are erratic and the integrated chart deflection value for the cycle is greater than 15 percent of full scale; or

(D) The contribution of all data read below the 15 percent level is less than 10 percent by mass of the final test results.

(iii) During the engine start-up, the HC analyzer is allowed to "spike" off-scale for a maximum of 5 seconds.

[48 FR 52210, Nov. 16, 1983, as amended at 52 FR 47874, Dec. 16, 1987]

§ 86.1339-88 Diesel particulate filter handling and weighing.

(a) At least 1 hour, but not more than 80 hours, before the test, place each filter in a closed (to eliminate dust contamination) but unsealed (to permit humidity exchange) petri dish and place in a weighing chamber meeting the specifications of § 86.1312-88 for stabilization.

(b) At the end of the stabilization period, weigh each filter on a balance having a precision of 20 micrograms and a readability of 10 micrograms. This reading is the tare weight and must be recorded (see § 86.1344-88(e)(18)).

(c) The filter shall then be stored in a covered petri dish or a sealed filter holder, either of which shall remain in the weighing chamber until needed for testing.

(d) If the filter is not used within 1 hour of its removal from the weighing chamber, it must be re-weighed before use. This limit of 1 hour may be replaced by an 8-hour limit if either of the following three conditions are met:

(1) A stabilized filter is placed and kept in a sealed filter holder assembly with the ends plugged, or

(2) A stabilized filter is placed in a sealed filter holder assembly, which is then immediately placed in a sample line through which there is no flow, or

(3) A combination of the conditions specified in paragraphs (d) (1) and (2).

(e) After the emissions test, and after the sample and back-up filters have been returned to the weighing room after being used, they must be conditioned for at least 1 hour but not more than 80 hours and then weighed. This reading is the gross weight of the filter and must be recorded (see § 86.1344-88(e)(18)).

(f) The net weight of each filter is its gross weight minus its tare weight. Should the sample on the filter contact the petri dish or any other surface, the test is void and must be rerun.

(g) The particulate filter weight (P_f) is the sum of the net weight of the primary filter plus the net weight of the back-up filter.

(h) The following optional weighting procedure is permitted:

(1) At the end of the stabilization period, weigh both the primary and back-up filters as a pair on a balance having a precision of 20 micrograms and a readability of 10 micrograms. This reading is the tare weight and must be recorded (see § 86.1344-88(e)(18)).

(2) After the emissions test, in removing the filters from the filter holder, the back-up filter is inverted on top of the primary filter. They must then be conditioned in the weighing chamber for at least one hour but not more than 80 hours. The filters are then weighed as a pair. This reading is the gross weight of the filters (P_f) and must be recorded (see § 86.1344-88(e)(18)).

(3) Paragraphs (a), (c), (d), and (f) of this section apply to this option, except that the word "filter" is replaced by "filters."

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10705, Mar. 15, 1985, as amended at 52 FR 47874, Dec. 16, 1987]

§ 86.1339-90 Particulate filter handling and weighing.

(a) At least 1 hour, but not more than 80 hours, before the test, place each filter in a closed (to eliminate dust contamination) but unsealed (to permit humidity exchange) petri dish and place in a weighing chamber meeting the specifications of § 86.1312 for stabilization.

(b) At the end of the stabilization period, weigh each filter on a balance having a precision of 20 micrograms and a readability of 10 micrograms. This reading is the tare weight and must be recorded (see § 86.1344(e)(18)).

(c) The filter shall then be stored in a covered petri dish or a sealed filter holder, either of which shall remain in the weighing chamber until needed for testing.

(d) If the filter is not used within 1 hour of its removal from the weighing chamber, it must be re-weighed before use. This limit of 1 hour may be replaced by an 8-hour limit if either of the following three conditions are met:

(1) A stabilized filter is placed and kept in a sealed filter holder assembly with the ends plugged, or

(2) A stabilized filter is placed in a sealed filter holder assembly, which is then immediately placed in a sample line through which there is no flow, or

(3) A combination of the conditions specified in paragraphs (d) (1) and (2).

(e) After the emissions test, and after the sample and back-up filters have been returned to the weighing room after being used, they must be conditioned for at least 1 hour but not more than 80 hours and then weighed. This reading is the gross weight of the filter and must be recorded (see § 86.1344(e)(18)).

(f) The net weight of each filter is its gross weight minus its tare weight. Should the sample on the filter contact the petri dish or any other surface, the test is void and must be rerun.

(g) The particulate filter weight (P_f) is the sum of the net weight of the primary filter plus the net weight of the backup filter.

(h) The following optional weighting procedure is permitted:

(1) At the end of the stabilization period, weigh both the primary and back-up filters as a pair on a balance having a precision of 20 micrograms and a readability of 10 micrograms. This reading is the tare weight and must be recorded (see § 86.1344(e)(18)).

(2) After the emissions test, in removing the filters from the filter holder, the back-up filter is inverted on top of the primary filter. They must then be conditioned in the weighing chamber for at least one hour but not more than 80 hours. The filters are then weighed as a pair. This reading is the gross weight of the filters (P_f) and must be recorded (see § 86.1344-90(e)(18)).

(3) Paragraphs (a), (c), (d), and (f) of this section apply to this option, except that the word "filter" is replaced by "filters."

[54 FR 14602, Apr. 11, 1989]

§ 86.1340-84 Exhaust sample analysis.

(a) The analyzer response may be read by automatic data collection (ADC) equipment such as computers, data loggers, etc. If ADC equipment is used the following is required:

(1) For bag analysis the analyzer response must be stable at greater than 99 percent of the final reading for the dilute exhaust sample bag. A single value representing the average chart deflection over a 10-second stabilized period shall be stored. For the background bag, all readings taken during the 10-second interval must be stable at the final value to within ±1 percent of full scale.

(2) For continuous analysis systems, the ADC system must read at least two analyzer readings per second. A single value representing the average integrated concentration over a cycle shall be stored.

(3) The chart deflections or average integrated concentrations required in paragraphs (a) (1) and (2) of this section may be stored on long-term computer storage devices such as computer tapes, storage discs, punch cards, or they may be printed in a listing for storage. In either case a chart recorder is not required and records from a chart recorder, if they exist, need not be stored.

(4) If the data from ADC equipment is used as permanent records, the ADC equipment and the analyzer values as interpreted by the ADC equipment are subject to the calibration specifications in §§ 86.1316-84 through 86.1326-84, as if the ADC equipment were part of the analyzer.

(b) Data records from any one or a combination of analyzers may be stored as chart recorder records.

(c)(1) Software zero and span.

(i) The use of "software" zero and span is permitted. The process of software zero and span refers to the technique of initially adjusting the analyzer zero and span responses to the calibration curve values, but for subsequent zero and span checks the analyzer response is simply recorded without adjusting the analyzer gain. The observed analyzer response recorded from the subsequent check is mathematically corrected back to the calibration curve values for zero and span. The same mathematical correction is then applied to the analyzer's response to a sample of exhaust gas in order to compute the true sample concentration.

(ii) The maximum amount of software zero and span mathematical correction is ±10 percent of full scale chart deflection.

(iii) Software zero and span may be used to switch between ranges without adjusting the gain of the analyzer.

(iv) The software zero and span technique may not be used to mask analyzer drift. The observed chart deflection before and after a given time period or event shall be used for computing the drift. Software zero and span may be used after the drift has been computed to mathematically adjust any span drift so that the "after" span check may be transformed into the "before" span check for the next segment.

(d) For bag sample analysis perform the following sequence:

(1) Warm-up and stabilize the analyzers; clean and/or replace filter elements, conditioning columns (if used), etc., as necessary.

(2) Obtain a stable zero reading.

(3) Zero and span the analyzers with zero and span gases. The span gases shall have concentrations between 75

and 100 percent of full-scale chart deflection. The flow rates and system pressures during spanning shall be approximately the same as those encountered during sampling. A sample bag may be used to identify the required analyzer range.

(4) *Re-check zero response.* If this zero response differs from the zero response recorded in paragraph (d)(3) of this section by more than 1 percent of full scale, then paragraphs (d)(2), (d)(3), and (d)(4) of this section should be repeated.

(5) If a chart recorder is used, identify and record the most recent zero and span response as the pre-analysis values.

(6) If ADC equipment is used, electronically record the most recent zero and span response as the pre-analysis values.

(7) Measure HC (except diesels), CO, CO_2, and NO_x sample and background concentrations in the sample bag(s) with approximately the same flow rates and pressures used in paragraph (d)(3) of this section. (Constituents measured continuously do not require bag analysis.)

(8) A post-analysis zero and span check of each range must be performed and the values recorded. The number of events that may occur between the pre and post checks is not specified. However, the difference between pre-analysis zero and span values (recorded in paragraph (d) (5) or (6)) of this section versus those recorded for the post-analysis check may not exceed the zero drift limit or the span drift limit of 2 percent of full scale chart deflection for any range used, otherwise the test is void.

(e) For continuous sample analysis perform the following sequence:

(1) Warm-up and stabilize the analyzers, clean and/or replace filter elements, conditioning columns (if used) etc., as necessary.

(2) Leak check portions of the sampling system that operate at negative gauge pressures when sampling, and allow heated sample lines, filters, pumps, etc., to stabilize at operating temperature.

(3) [Optional] Perform a hang-up check for the HFID sampling system:

(i) Zero the analyzer using zero air introduced at the analyzer port.

(ii) Flow zero air through the overflow sampling system. Check the analyzer response.

(iii) If the overflow zero response exceeds the analyzer zero response by 2 percent or more of the HFID full-scale deflection, hang-up is indicated and corrective action must be taken.

(iv) The complete system hang-up check specified in paragraph (f) of this section is recommended as a periodic check.

(4) Obtain a stable zero reading.

(5) Zero and span each range to be used on each analyzer used prior to the beginning of the cold cycle. The span gases shall have a concentration between 75 and 100 percent of full scale chart deflection. The flow rates and system pressures shall be approximately the same as those encountered during sampling. The HFID analyzer shall be zeroed and spanned through the overflow sampling system.

(6) *Re-check zero response.* If this zero response differs from the zero response recorded in paragraph (e)(5) of this section by more than 1 percent of full scale, then paragraphs (e)(4), (e)(5), and (e)(6) of this section should be repeated.

(7) If a chart recorder is used, identify and record the most recent zero and span response as the pre-analysis values.

(8) If ADC equipment is used, electronically record the most recent zero and span response as the pre-analysis values.

(9) Measure the emissions (HC required for diesels, NO_x, CO, CO_2 optional) continuously during the cold start cycle. Indicate the start of the test, the range(s) used, and the end of the test on the recording medium (chart paper or ADC equipment). Maintain approximately the same flow rates and system pressures used in paragraph (e)(5) of this section.

(10) Collect background HC, CO, CO_2, and NO_x, in a sample bag.

(11) Perform a post-analysis zero and span check for each range used at the conditions specified in paragraph (e)(5) of this section. Record these responses as the post-analysis values.

(12) Neither the zero drift nor the span drift between the pre-analysis and post-analysis checks on any range used may exceed 3 percent for HC or 2 percent for NO_x, CO, and CO_2 of full scale chart deflection, or the test is void. (If the HC drift is greater than 3 percent of full-scale chart deflection, hydrocarbon hang-up is likely.)

(13) Determine HC background levels for the cold start cycle by introducing the background sample into the overflow sample system.

(14) Determine background levels of NO_x, CO, or CO_2 (if necessary) by the bag technique outlined in paragraph (d) of this section.

(15) Repeat paragraphs (e) (4) through (14) of this section for the hot cycle. The post-analysis zero and span check for the cold start (or previous hot start) cycle may be used for the pre-analysis zero and span for the following hot start cycle.

(f) *HC hang-up.* If HC hang-up is indicated, the following sequence may be performed.

(1) Fill a clean sample bag with background air.

(2) Zero and span the HFID at the analyzer ports.

(3) Analyze the background air sample bag through the analyzer ports.

(4) Analyze the background air through the entire sample probe system.

(5) If the difference between the readings obtained is 2 percent or more of the HFID full scale deflection, clean the sample probe and the sample line.

(6) Reassemble the sample system, heat to specified temperature, and repeat the procedure in paragraphs (f) (1) through (6) of this section.

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[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48146, Dec. 10, 1984]

§ 86.1340-90 Exhaust sample analysis.

(a) The analyzer response may be read by automatic data collection (ADC) equipment such as computers, data loggers, etc. If ADC equipment is used the following is required:

(1) For bag analysis, the analyzer response must be stable at greater than 99 percent of the final reading for the dilute exhaust sample bag. A single value representing the average chart deflection over a 10-second stabilized period shall be stored. For the background bag, all readings taken during the 10-second interval must be stable at the final value to within ±1 percent of full scale.

(2) For continuous analysis systems, the ADC system must read at least two analyzer readings per second. A single value representing the average integrated concentration over a cycle shall be stored.

(3) The chart deflections or average integrated concentrations required in paragraphs (a) (1) and (2) of this section may be stored on long-term computer storage devices such as computer tapes, storage discs, punch cards, or they may be printed in a listing for storage. In either case a chart recorder is not required and records from a chart recorder, if they exist, need not be stored.

(4) If the data from ADC equipment is used as permanent records, the ADC equipment and the analyzer values as interpreted by the ADC equipment are subject to the calibration specifications in §§ 86.1316 through 86.1326, as if the ADC equipment were part of the analyzer.

(b) Data records from any one or a combination of analyzers may be stored as chart recorder records.

(c) *Software zero and span.* (1) The use of "software" zero and span is permitted. The process of software zero and span refers to the technique of initially adjusting the analyzer zero and span responses to the calibration curve values, but for subsequent zero and span checks the analyzer response is simply recorded without adjusting the analyzer gain. The observed analyzer response recorded from the subsequent check is mathematically corrected back to the calibration curve values for zero and span. The same mathematical correction is then applied to the analyzer's response to a sample of exhaust gas in order to compute the true sample concentration.

(2) The maximum amount of software zero and span mathematical cor-

rection is ±10 percent of full scale chart deflection.

(3) Software zero and span may be used to switch between ranges without adjusting the gain of the analyzer.

(4) The software zero and span technique may not be used to mask analyzer drift. The observed chart deflection before and after a given time period or event shall be used for computing the drift. Software zero and span may be used after the drift has been computed to mathematically adjust any span drift so that the "after" span check may be transformed into the "before" span check for the next segment.

(d) For bag sample analysis perform the following sequence:

(1) Warm-up and stabilize the analyzers; clean and/or replace filter elements, conditioning columns (if used), etc., as necessary.

(2) Obtain a stable zero reading.

(3) Zero and span the analyzers with zero and span gases. The span gases shall have concentrations between 75 and 100 percent of full-scale chart deflection. The flow rates and system pressures during spanning shall be approximately the same as those encountered during sampling. A sample bag may be used to identify the required analyzer range.

(4) Re-check zero response. If this zero response differs from the zero response recorded in paragraph (d)(3) of this section by more than 1 percent of full scale, then paragraphs (d) (2), (3), and (4) of this section should be repeated.

(5) If a chart recorder is used, identify and record the most recent zero and span response as the pre-analysis values.

(6) If ADC equipment is used, electronically record the most recent zero and span response as the pre-analysis values.

(7) Measure HC (except diesels), CO, CO_2, and NOx sample and background concentrations in the sample bag(s) with approximately the same flow rates and pressures used in paragraph (d)(3) of this section. (Constituents measured continuously do not require bag analysis.)

(8) A post-analysis zero and span check of each range must be performed and the values recorded. The number of events that may occur between the pre and post checks is not specified. However, the difference between pre-analysis zero and span values (recorded in paragraph (d) (5) or (6) of this section) versus those recorded for the post-analysis check may not exceed the zero drift limit or the span drift limit of 2 percent of full scale chart deflection for any range used. Otherwise the test is void.

(e) For continuous sample analysis perform the following sequence:

(1) Warm-up and stabilize the analyzers; clean and/or replace filter elements, conditioning columns (if used), etc., as necessary.

(2) Leak check portions of the sampling system that operate at negative gauge pressures when sampling, and allow heated sample lines, filters, pumps, etc., to stabilize at operating temperature.

(3) *Optional:* Perform a hang-up check for the HFID sampling system:

(i) Zero the analyzer using zero air introduced at the analyzer port.

(ii) Flow zero air through the overflow sampling system. Check the analyzer response.

(iii) If the overflow zero response exceeds the analyzer zero response by 2 percent or more of the HFID full-scale deflection, hang-up is indicated and corrective action must be taken.

(iv) The complete system hang-up check specified in paragraph (f) of this section is recommended as a periodic check.

(4) Obtain a stable zero reading.

(5) Zero and span each range to be used on each analyzer used prior to the beginning of the cold cycle. The span gases shall have a concentration between 75 and 100 percent of full scale chart deflection. The flow rates and system pressures shall be approximately the same as those encountered during sampling. The HFID analyzer shall be zeroed and spanned through the overflow sampling system.

(6) Re-check zero response. If this zero response differs from the zero response recorded in paragraph (e)(5) of this section by more than 1 percent of full scale, then paragraphs (e) (4), (5), and (6) of this section should be repeated.

(7) If a chart recorder is used, identify and record the most recent zero and span response as the pre-analysis values.

(8) If ADC equipment is used, electronically record the most recent zero and span response as the pre-analysis values.

(9) Measure the emissions (HC required for diesels; NOx, CO, CO_2 optional) continuously during the cold start cycle. Indicate the start of the test, the range(s) used, and the end of the test on the recording medium (chart paper or ADC equipment). Maintain approximately the same flow rates and system pressures used in paragraph (e)(5) of this section.

(10) Collect background HC, CO, CO_2, and NOx in a sample bag.

(11) Perform a post-analysis zero and span check for each range used at the conditions specified in paragraph (e)(5) of this section. Record these responses as the post-analysis values.

(12) Neither the zero drift nor the span drift between the pre-analysis and post-analysis checks on any range used may exceed 3 percent for HC, or 2 percent for NOx, CO, and CO_2, of full scale chart deflection, or the test is void. (If the HC drift is greater than 3 percent of full-scale chart deflection, hydrocarbon hang-up is likely.)

(13) Determine HC background levels for the cold start cycle by introducing the background sample into the overflow sample system.

(14) Determine background levels of NOx, CO, or CO_2 (if necessary) by the bag technique outlined in paragraph (d) of this section.

(15) Repeat paragraphs (e) (4) through (14) of this section for the hot cycle. The post-analysis zero and span check for the cold start (or previous hot start) cycle may be used for the pre-analysis zero and span for the following hot start cycle.

(f) *HC hang-up.* If HC hang-up is indicated, the following sequence may be performed:

(1) Fill a clean sample bag with background air.

(2) Zero and span the HFID at the analyzer ports.

(3) Analyze the background air sample bag through the analyzer ports.

(4) Analyze the background air through the entire sample probe system.

(5) If the difference between the readings obtained is 2 percent or more of the HFID full scale deflection, clean the sample probe and the sample line.

(6) Reassemble the sample system, heat to specified temperature, and repeat the procedure in paragraphs (f) (1) through (6) of this section.

(g) *For CH_3OH* (methanol-fueled vehicles):

(1) Introduce a reference sample of methanol (the concentration of methanol in deionized water is known, and is C_{MR} in the calculations) into the gas chromatograph and measure the area of the response peak. This reference sample peak area is A_{MR} in the calculations.

(2) Introduce test samples into the gas chromatograph and measure the area of the response peak. This peak area is A_{MS} in the calculations.

(h) *For HCHO* (methanol-fueled vehicles):

(1) Introduce a reference sample of formaldehyde (the concentration of formaldehyde as a dinitrophenylhydrazine derivative in acetonitrile (C_{FR}) is known) into the high pressure liquid chromatograph and measure the area of the response peak. This reference sample peak area is A_{FR} in the calculations.

(2) Introduce test samples into the high pressure liquid chromatograph and measure the area of the response peak. This peak area is A_{FS} in the calculations.

[54 FR 14602, Apr. 11, 1989]

§ 86.1341-84 Test cycle validation criteria.

(a) To minimize the biasing effect of the time lag between the feedback and reference cycle values, the entire engine speed and torque feedback signal sequence may be advanced or delayed in time with respect to the reference speed and torque sequence. If the feedback signals are shifted, both speed and torque must be shifted the same amount in the same direction.

(b) *Brake horsepower-hour calculation.* (1) Actual brake horsepower-hour shall be calculated using each pair of engine feedback speed and torque values recorded. This shall be done after any feedback data shift has occurred (see § 86.1341-84(a)), if this option is selected. This actual brake horsepower-hour figure is used for comparison to reference brake horsepower-hour (see § 86.1341-84 (b)(3) and (b)(4)) and for calculating brake specific emissions.

(2) (i) The same methodology shall be used for integrating both reference and actual brake horsepower-hour.

(ii) If values must be determined between adjacent reference or adjacent measured values then linear interpolation must be used.

(iii) In integrating the reference and actual brake horsepower-hour, all negative torque values shall be set equal to zero and included.

(iv) If integration is performed at a frequency of less than 5 Hertz, and if, during a given time segment, the torque value changes from positive to negative or negative to positive, then the negative portion must be computed and set equal to zero.

(v) The positive portion is included in the integrated value.

(vi) All calculations shall be made to at least five significant digits.

(3) For diesel engines, the actual brake horsepower-hour for each cycle (cold and hot start) shall be between −15 percent and +5 percent of the integrated reference brake horsepower-hour, or the test is void.

(4) For gasoline engines, the actual brake horsepower-hour for the cold cycle shall be within ±5 percent of the reference brake horsepower-hour, or the test is void. The tolerance for the hot cycle shall be ±4 percent.

(c) *Regression Line Analysis to Calculate Validation Statistics.* (1) Linear regressions of feedback value on reference value shall be performed for speed, torque, and brake horsepower. This shall be done after any feedback data shift has occurred (see § 86.1341-84(a)), if this option is selected. The method of least squares shall be used, with the best fit equation having the form:

$y = mx + b$

Where:

y = The feedback (actual) value of speed (in rpm), torque (in ft-lbs), or brake horsepower
m = Slope of the regression line
x = The reference value (speed, torque, or brake horsepower)
b = The y intercept of the regression line

(2) The standard error of estimate (SE) of y on x and the coefficient of determination (r^2) shall be calculated for each regression line.

(3) It is recommended that this analysis be performed at 1 Hertz.

(4) For diesel engines, all reference torque values specified in Appendix I, (f)(2) as "closed rack motoring" and the associated feedback values shall be deleted from the calculation of cycle torque and power validation statistics.

(5) For a test to be considered valid, the criteria in Figure N84-11 must be met for both cold and hot cycles individually. Point deletions from the regression analyses are permitted where noted in Figure N84-11.

(d) If a dynamometer test run is determined to be void due to reasons such as experimental errors, or violation of validation statistics or integrated horsepower-hour criterion, then corrective action shall be taken. The engine shall then be (1) allowed to cool (naturally or forced) and the dynamometer test rerun per § 86.1337-84 or (2) be retested per § 86.1336-84(e).

FIGURE N84-11—REGRESSION LINE TOLERANCES

	Speed	Torque	BHP
Diesel Engines			
Standard error of estimate (SE) of Y on X.	100 rpm	13 pct of power map maximum engine torque.	8 pct of power map maximum BHP.
Slope of the regression line, m	0.970 to 1.030	0.83–1.03 hot, 0.77–1.03 cold	0.89–1.03 (hot) 0.87-1.03 (cold).
Coefficient of determination, r^2	0.9700 [1]	0.8800 (hot) [1] 0.8500 (cold) [1]	0.9100.[1]

FIGURE N84-11—REGRESSION LINE TOLERANCES—Continued

	Speed	Torque	BHP
Y intercept of the regression line, b..	±50 rpm	±15 ft-lb	±5.0 BHP.
Gasoline Engines			
Standard error of estimate (SE) of Y on X.	100 rpm	10 pct (hot) 11 pct (cold) of power map max engine torque.	5 pct (hot) 6 pct (cold) of power map max. BHP.
Slope of the regression line	0.980 to 1.020	0.92–1.03 (hot) 0.86–1.03 (cold)	0.93–1.03 (hot) 0.89–1.03 (cold).
Coefficient of determination r^2	0.9700 [1]	0.9300 (hot) [1] 0.9000 (cold) [1]	0.9400 (hot) [1] 0.9300 (cold). [1]
Y intercept of the regression b	±25 (hot) ±40 (cold)	±4 pct (hot) ±5 pct (cold) of power map max. engine torque.	±2 pct (hot) ±2.5 pct (cold) of power map max. BHP.

[1] Minimum.

PERMITTED POINT DELETIONS FROM REGRESSION ANALYSIS

Condition	Points to be deleted
First 24 seconds (#1) of free idle hot and cold cycles	Speed, Torque, BHP.
Wide-open throttle and speed control, and torque feedback < torque reference	Torque, BHP.
Wide-open throttle and torque control, and feedback < speed reference	Speed, BHP.
Speed control, and gasoline-fueled engine and closed throttle and torque reference < torque feedback, and:	
A. Manual transmission, and reference torque not equal to zero, or	Torque, BHP.
B. Automatic transmission, and reference torque not equal to curb idle transmission torque.	Same as above.
Speed control, and diesel engine, and reference torque equals "Closed Rack Motoring".	Same as above.
Gasoline-fueled engine, and equipped with cold-start enhancement device and first 150 seconds of cold cycle or first 30 seconds of hot cycle, and closed throttle, and no clutch (or with clutch engaged during idle periods) and:	
A. Manual transmission, and torque feedback is equal to zero (±10 ft lb), or	Speed, BHP.
B. Automatic transmission, and torque feedback is equal to curb idle transmission torque (±10 ft lb).	Same as above.
Diesel-fueled engine, and equipped with cold engine idle speed enrichment up to the first 180 seconds or cold cycle or up to the first 30 seconds of hot cycle, the sum of the seconds deleted from the cold cycle plus the sum of the seconds deleted from the hot cycle may not exceed 180 seconds and closed throttle and no clutch (or with clutch engaged during idle periods), and:	
A. Manual transmission, and torque feedback is equal to zero (±10 ft-lb)	Same as above.
B. Automatic transmission, and torque feedback is equal to curb idle transmission torque (±10 ft-lb).	Speed, BHP.
Speed control and engine equipped with an operating clutch, and clutch disengaged.	Same as above.

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[52 FR 47874, Dec. 16, 1987]

§ 86.1341-90 Test cycle validation criteria.

(a) To minimize the biasing effect of the time lag between the feedback and reference cycle values, the entire engine speed and torque feedback signal sequence may be advanced or delayed in time with respect to the reference speed and torque sequence. If the feedback signals are shifted, both speed and torque must be shifted the same amount in the same direction.

(b) Calculate the brake horsepower for each pair of engine feedback speed and torque values recorded. Also calculate the reference brake horsepower for each pair of engine speed and torque reference values. Calculations shall be to five significant digits.

(c) Linear regressions of feedback value on reference value shall be performed for speed, torque and brake horsepower. The method of least-squares shall be used, with the best fit equation having the form:

$y=mx+b$

Where:

(1) y=The feedback (actual) value of speed (rpm), torque (ft-lbs), or brake horsepower.

(2) m=Slope of the regression line.

(3) x=The reference value (speed, torque, or brake horsepower).

(4) b=The y-intercept of the regression line.

(d) The standard error of estimate (SE) of y on x and the coefficient of determination (r^2) shall be calculated for each regression line.

(e) For a test to be considered valid, the criteria in Figure N90-11 must be met for both cold and hot cycles individually. Point deletions from the regression analyses are permitted where noted in Figure N90-11.

FIGURE N90–11

	Speed	Torque	BHP
Regression Line Tolerances			
Petroleum-fueled and methanol-fueled diesel engines			
Standard error of estimate (SE) of Y on X	100 rpm	13 pct of power map maximum engine torque.	8 pct of power map maximum BHP.
Slope of the regression line, m	0.970 to 1.030	0.83–1.03 (hot), 0.77–1.03 (cold)	0.89–1.03 (hot), 0.87–1.03 (cold).
Coefficient of determination, r^2	[1] 0.9700	[1] 0.8800 (hot), [1] 0.8500 (cold)	[1] 0.9100.
Y intercept of the regression line, b	±50 rpm	±15 ft-lb +	±5.0 BHP.
Gasoline-fueled and methanol-fueled Otto-cycle engines			
Standard error of estimate (SE) of Y on X	100 rpm	10% (hot), 11% (cold) of power map max. engine torque.	5% (hot), 6% (cold) of power map max. BHP.
Slope of the regression line, m	0.980 to 1.020	0.92–1.03 (hot), 0.88–1.03 (cold)	0.93–1.03 (hot), 0.89–1.03 (cold)
Coefficient of determination, r^2	[1] 0.9700	[1] 0.9300 (hot), [1] 0.9000 (cold)	[1] 0.9400 (hot), [1] 0.9300 (cold)
Y intercept of the regression line, b	±25 (hot), ±40 (cold).	±4% (hot), ±5% (cold) of power map max. engine torque.	±2.0% (hot), ±2.5% (cold) of power map BHP.

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[1] Minimum.

PERMITTED POINT DELETIONS FROM REGRESSION ANALYSIS

Condition	Points to be deleted
First 24 (±1) seconds of free idle of hot and cold cycles	Speed, Torque, BHP.
Wide-open throttle, and speed control, and torque feedback, torque reference	Torque, BHP.
Wide open throttle, and torque control, and speed feedback, speed reference	Speed, BHP.
Speed control, and gasoline-fueled or methanol-fueled Otto-cycle engine, and closed throttle, and torque reference, torque feedback, and:	
A. Manual transmission, and reference torque not equal to zero, or	Torque, BHP.
B. Automatic transmission, and reference torque not equal to curb idle transmission torque	Do.
Speed control, and petroleum-fueled or methanol-fueled diesel engine, and reference torque equals "closed rack"	Do.
Gasoline-fueled or methanol-fueled Otto cycle engine, and equipped with automatic choke, and first 150 s. of cold cycle or first 30 s. of hot cycle, and closed throttle, and no clutch (or with clutch engaged during idle periods), and:	
A. Manual transmission, and torque feedback is equal to zero (±10 ft-lbs), or	Speed, BHP.
B. Automatic transmission, and torque feedback is equal to curb idle transmission torque (±10 ft-lbs)	Do.
Petroleum-fueled or methanol fueled diesel engines equipped with cold engine idle speed enrichment up to the first 180 s. of cold cycle or up to the first 30 s. of hot cycle, the sum of the seconds deleted of cold cycle plus the sum of the seconds deleted from the hot cycle may not exceed 180 s. and closed throttle and no clutch (or with clutch engaged during idle periods), and:	
A. Manual transmission, and torque feedback is equal to zero (±10ft-lbs)	Do.
B. Automatic transmission, and torque feedback is equal to curb idle transmission torque (±10 ft-lbs)	Do.
Engine equipped with an operating clutch, and clutch disengaged	Do.

(f)(1) The integrated brake horsepower-hour for each cycle (cold and hot start) shall be between −15 percent and +5 percent of the integrated brake horsepower-hour for the reference cycle, or the test is void.

(2) For gasoline-fueled and methanol-fueled Otto-cycle engines, the integrated brake horsepower-hour of the feedback cycle shall be within 5 percent of the integrated brake horsepower-hour of the reference cycle for the cold cycle, or the test is void. The tolerance for the hot cycle shall be 4 percent.

(g) If a dynamometer test run is determined to be statistically or experimentally void, corrective action shall be taken. The engine shall then be allowed to cool (naturally or forced) and the dynamometer test rerun per § 86.1337.

(h) For petroleum-fueled and methanol-fueled diesel engines, all reference torque values specified (in paragraph (f)(2) of Appendix I to this part) as "closed rack" shall be deleted from the calculation of cycle torque and power validation statistics. Associated reference and feedback brake horsepower points shall be set equal to zero for purposes of calculating integrated power-hour for petroleum-fueled and methanol-fueled diesel engines, and also for gasoline-fueled and methanol-fueled Otto-cycle engines whenever the reference torque is less than zero percent. (Note the regression deletions are specified in Figure N90-11.)

[54 FR 14604, Apr. 11, 1989]

§ 86.1342-84 Calculations; exhaust emissions.

(a) The final reported transient emission test results shall be computed by use of the following formula:

$$A_{wm} = \frac{1/7(g_C) + 6/7(g_H)}{1/7(\text{BHP-hr}_C) + 6/7(\text{BHP-hr}_H)}$$

Where:

A_{wm} = Weighted mass emission level (HC, CO, CO_2, or NO_x) in grams per brake horsepower-hour.

g_C = Mass emission level in grams, measured during the cold start test.

g_H = Mass emission level in grams, measured during the hot start test.

BHP-hr_C = Total brake horsepower-hour (brake horsepower integrated over time) for the cold start test.

BHP-hr_H = Total brake horsepower-hour (brake horsepower integrated over time) for the hot start test.

(b) The mass of each pollutant for the cold start test and the hot start test for bag measurements and diesel heat exchanger sample system measurements is determined from the following equations:

(1) Hydrocarbon mass:

$$HC_{mass} = V_{mix} \times Density_{HC} \times (HC_{conc}/10^6)$$

(2) Oxides of nitrogen mass:

$$NOx_{mass} = V_{mix} \times Density_{NO2} \times K_H \times (NOx_{conc}/10^6)$$

(3) Carbon monoxide mass:

$$CO_{mass} = V_{mix} \times Density_{CO} \times (CO_{conc}/10^6)$$

(4) Carbon dioxide mass:

$$CO_{2mass} = V_{mix} \times Density_{CO2} \times (CO_{2conc}/10^2)$$

(c) The mass of each pollutant for the cold start test and the hot start test for flow compensated sample systems is determined from the following equations:

(1) $$HC_{mass} = \sum_{i=1}^{n} \left[\frac{(HC_e)_i}{10^6} \times (V_{mix})_i \times (Density_{HC}) \times \Delta T \right] - \frac{HC_d}{10^6}\left(1-\frac{1}{DF}\right) \times V_{mix} \times Density_{HC}$$

(2) $$NOx_{mass} = K_H \times \sum_{i=1}^{n} \left[\frac{(NOx_e)_i}{10^6} \times (V_{mix})_i \times (Density_{NO_2}) \times \Delta T \right] - K_H \times \frac{NOx_d}{10^6}\left(1-\frac{1}{DF}\right) \times V_{mix} \times Density_{NO_2}$$

(3) $$CO_{mass} = \sum_{i=1}^{n} \left[\frac{(CO_e)_i}{10^6} \times (V_{mix})_i \times (Density_{CO}) \times (\Delta T) \right] - \frac{(CO_d)}{10^6}(1-1/DF) \times V_{mix} \times Density_{CO}$$

(4) $$CO_{2\,mass} = \sum_{i=1}^{n} \left[\frac{(CO_{2e})_i}{10^6} \times (V_{mix})_i \times (Density_{CO_2}) \times \Delta T \right] - \frac{CO_{2d}}{10^6}\left(1-\frac{1}{DF}\right) \times V_{mix} \times Density_{CO_2}$$

(d) Meaning of symbols:

(1) HC_{mass} = Hydrocarbon emissions, in grams per test phase.

$Density_{HC}$ = Density of hydrocarbons is 16.33 g/ft^3 (0.5768 kg/m^3) for gasoline and may be used for all fuels if desired, 16.42 g/ft^3 (0.5800 kg/m^3) for #1 diesel, and 16.27 (0.5746 kg/m^3) for #2 diesel, assuming an average carbon to hydrogen ratio of 1:1.85 for gasoline, 1:1.93 for #1 diesel, and 1:1.80 for #2 diesel at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.

HC_{conc} = Hydrocarbon concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent (i.e., equivalent propane ×3).

$HC_{conc} = HC_e - HC_d[1-(1/DF)]$

Where:

HC_e = Hydrocarbon concentration of the dilute exhaust bag sample or, for diesel heat exchanger systems, average hydrocarbon concentration of the dilute exhaust sample as calculated from the integrated HC traces, in ppm carbon equivalent. For flow compensated sample systems $(HC_e)_i$ is the instantaneous concentration.

HC_d = Hydrocarbon concentration of the dilution air as measured, in ppm carbon equivalent.

(2) NOx_{mass} = Oxides of nitrogen emissions, in grams per test phase.

$Density_{NO2}$ = Density of oxides of nitrogen is 54.16 g/ft^3 (1.913 kg/m^3), assuming they are in the form of nitrogen dioxide, at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.

NOx_{conc} = Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, in ppm:

$NOx_{conc} = NOx_e - NOx_d[1-(1/DF)]$

Where:

NOx_e = Oxides of nitrogen concentration of the dilute exhaust bag sample as measured, in ppm. For flow compensated sample systems $(NOx_e)_i$ is the instantaneous concentration.

NOx_d = Oxides of nitrogen concentration of the dilute air as measured, in ppm.

(3) CO_{mass} = Carbon monoxide emissions, grams per test phase.

$Density_{CO}$ = Density of carbon monoxide is 32.97 g/ft³ (1.164 kg/m³), at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.

CO_{conc} = Carbon monoxide concentration of the dilute exhaust sample corrected for background, water vapor, and CO_2 extraction, ppm.

$CO_{conc} = CO_e - CO_d(1 - 1/DF)$.

Where:

CO_e = Carbon monoxide concentration of the dilute exhaust bag sample volume corrected for water vapor and carbon dioxide extraction, ppm. For flow compensated sample systems, $(CO_e)_i$ is the instantaneous concentration. (The calculation assumes the carbon to hydrogen ratio of the fuel is 1:1.85.)

$CO_e = [1 - 0.01925CO_{2e} - 0.000323R]CO_{em}$

Where:

CO_{em} = Carbon monoxide concentration of the dilute exhaust sample as measured, ppm.

CO_{2e} = Carbon dioxide concentration of the dilute exhaust bag sample, in percent, if measured. For flow compensated sample systems, $(CO_{2e})_i$ is the instantaneous concentration. For cases where exhaust sampling of CO_2 is not performed, the following approximation is permitted:

$$CO_{2e} = \left(\frac{44.010}{12.011 + (1.008\alpha)} \right) \times \left(\frac{M'(453.6)}{Density_{CO2}} \right) \times \left(\frac{100}{V_{mix}} \right)$$

α = Average carbon to hydrogen ratio.

M' = Fuel mass consumed during the test cycle.

R = Relative humidity of the dilution air, percent.

CO_d = Carbon monoxide concentration of the dilution air corrected for water vapor extraction, ppm.

$CO_d = (1 - 0.000323R)CO_{dm}$

Where:

CO_{dm} = Carbon monoxide concentration of the dilution air sample as measured, ppm.

NOTE: If a CO instrument which meets the criteria specified in § 86.1311-84 is used and the conditioning column has been deleted, CO_{em} must be substituted directly for CO_e and CO_{dm} must be substituted directly for CO_d.

(4) CO_{2mass} = Carbon dioxide emissions, in grams per test phase.

Density CO_2 = Density of carbon dioxide is 51.81g/ft³ (1.830 kg/m³), at 68 °Φ (20 °C) and 760 mm Hg (101.3 kPa) pressure.

$CO_{2\,conc}$ = Carbon dioxide concentration of the dilute exhaust sample corrected for background, in percent.

$CO_{2\,conc} = CO_{2\,e} - CO_{2\,d}[1 - (1/DF)]$

Where:

$CO_{2\,d}$ = Carbon dioxide concentration of the dilution air as measured, in percent.

(5) $DF = 13.4/[CO_{2e} + (HC_e + CO_e) \times 10^{-4}]$, or $DF = 13.4/CO_{2e}$.

(6) K_H = Humidity correction factor.

For gasoline engines: $K_H = 1/[1-0.0047\ (H-75)]$

(or for SI units $= 1/[1-0.0329\ (H-10.71)]$).

For diesel engines: $K_H = 1/[1-0.0026\ (HU-75)]$

(or for SI units $= 1/[1-0.0182\ (H-10.71)]$).

Where:

H = Absolute humidity of the engine intake air in grains (grams) of water per pound (kilogram) or dry air.

$H = [(43.478)\ R_i \times P_d]/[P_B - (P_d \times R_i/100)]$, and

$= [(6.211)\ R_i \times P_d]/[P_B - (P_d \times R_i/100)]$ for SI units.

R_i = Relative humidity of the engine intake air, in percent.

P_d = Saturated vapor pressure, in mm Hg (kPa) at the engine intake air dry bulb temperature.

P_B = Barometric pressure, in mm Hg (kPa).

(e) Sample calculation of mass values of exhaust emissions:

(1) Assume the following test results for a gasoline engine:

	Cold start cycle test results	Hot start cycle test results
V_{mix}	6,924 Ft³	6,873 ft³
R	30.2 percent	30.2 percent.
R_i	30.2 percent	30.2 percent.
P_B	735 mm Hg	735 mm Hg.
P_d	22.676 mm Hg	22.676 mm Hg.
HC_e	132.07 ppm C equiv	86.13 ppm C equiv.
NO_{xe}	7.86 ppm	10.98 ppm.
CO_{em}	171.22 ppm	114.28 ppm.

	Cold start cycle test results	Hot start cycle test results
CO_{2e}	.178 percent	.381 percent.
HC_d	3.60 ppm C Equiv.	8.70 ppm C Equiv.
NO_{xd}	0.0 ppm	0.10 ppm.
CO_{dm}	0.89 ppm	0.89 pp.
CO_{2d}	0.0 percent	0.038 percent.
PHP-hr	0.259	0.347.

Then:

Cold Start Test

$H = [(43.478)(30.2)(22.676)]/[735-(22.676)(30.2)/100]$ $=41$ grains of water per pound of dry air.

$K_H = 1/[1-0.0047(41-75)] = 0.862$

$CO_e = [1-0.01925(.178)-0.000323(30.2)]171.22 = 169.0$ ppm

$CO_d = [1-0.000323(30.2)]0.89 = .881$ ppm

$DF = 13.4/[.178+(132.07+169.0)(10^{-4})] = 64.390$

$HC_{conc} = 132.07-3.6[1-(1/64.390)] = 128.5$ ppm

$HC_{mass} = 6924(16.33)(128.5/1{,}000{,}000) = 14.53$ grams

$Nox_{conc} = 7.86-0.0[1-(1/64.390)] = 7.86$ ppm

$NOx_{mass} = 6924(54.16)(.862)(7.86/1{,}000{,}000) = 2.54$ grams

$CO_{conc} = 169.0-.881[1-(1/64.390)] = 168.0$ ppm

$CO_{mass} = 6924(32.97)(168.0/1{,}000{,}000) = 38.35$ grams

$CO_{2\,conc} = .178-0[1-1/64.390)] = .178\%$

$CO_{2\,mass} = 6924(51.81)(.178/100) = 639$ grams

Hot Start Test

Similar calculations result in the following:

$HC_{mass} = 8.72$ grams

$NOx_{mass} = 3.49$ grams

$CO_{mass} = 25.70$ grams

$CO_{2\,mass} = 1226$ grams

(2) Weighted mass emission results:

$$HC_{wm} = \frac{1/7(14.53)+6/7(8.72)}{1/7(0.259)+6/7(0.347)} = 28.6 \text{ grams/BHP-hr}$$

$$NOx_{wm} = \frac{1/7(2.54)+6/7(3.49)}{1/7(0.259)+6/7(0.347)} = 10.0 \text{ grams/BHP-hr}$$

$$CO_{wm} = \frac{1/7(38.35)+6/7(25.70)}{1/7(0.259)+6/7(0.347)} = 82.2 \text{ grams/BHP-hr}$$

$$CO_{2wm} = \frac{1/7(639)+6/7(1226)}{1/7(0.259)+6/7(0.347)} = 3415 \text{ grams/BHP-hr}$$

(f) The final reported brake-specific fuel consumption (BSFC) shall be computed by use of the following formula:

$$BSFC = \frac{1/7(M_C)+6/7(M_H)}{1/7(BHP\text{-}hr_C)+6/7(BHP\text{-}hr_H)}$$

Where:

BSFC = brake-specific fuel consumption in pounds of fuel per brake horsepower-hour (lbs/BHP-hr)

M_C = mass of fuel, in pounds, used by the engine during the cold start test

M_H = mass of fuel, in pounds, used by the engine during the hot start test

BHP-hr_C = total brake horsepower-hours (brake horsepower integrated with respect to time) for the cold start test

$BHP\text{-}hr_H$ = total brake horsepower-hours (brake horsepower integrated with respect to time) for the hot start test

(g) The mass of fuel for the cold start and hot start test is determined from mass fuel flow measurements made during the tests, or from the following equation:

$M = (G_c/R_2)(1/453.6)$

(1) Meaning of symbols:

M = Mass of fuel, in pounds, used by the engine during the cold or hot start test

G_c = Grams of carbon measured during the cold or hot start test:

$G_c = [12.011/(12.011 + \alpha(1.008))]HC_{mass} + 0.429CO_{mass} + 0.273CO_{2mass}$

Where:

HC_{mass} = Hydrocarbon emissions, in grams for cold or hot start test

CO_{2mass} = carbon monoxide emissions, in grams for cold or hot start test

CO_{2mass} = Carbon dioxide emissions, in grams for cold or hot start test

α = The atomic hydrogen to carbon ratio of the fuel

R_2 = The grams of carbon in the fuel per gram of fuel

$R_2 = 12.011/[12.011 + \alpha(1.008)]$

(h) Sample calculation of brake-specific fuel consumption:

(1) Assume the following test results:

	Cold start cycle test results	Hot start cycle test results
BHP-hr	6.945	7.078
α	1.85	1.85
HC_{mass} (grams)	37.08	28.82
CO_{mass} (grams)	357.69	350.33
$CO_{2\ mass}$ (grams)	5,419.62	5,361.32

Then:

G_c for cold start test = $[12.011/(12.011 + (1.85)(1.008))](37.08) + 0.429(357.69) + 0.273(5419.62) = 1665.10$ grams

G_c for hot start test = $[12.011/(12.011 + (1.85)(1.008))](28.82) + 0.429(350.33) + 0.273(5361.32) = 1638.88$ grams

$R_2 = 12.011/[12.011 + 1.85(1.008)] = .866$

$M_c = (1665.10/.866)(1/453.6) = 4.24$ lbs. (calculated), or

= 4.24 lbs. (directly measured).

$M_H = (1638.88/.866)(1/453.6) = 4.17$ lbs. (calculated), or

= 4.17 lbs. (directly measured).

(2) Brake-specific fuel consumption results:

$$BSFC = \frac{1/7(4.24) + 6/7(4.17)}{1/7(6.945) + 6/7(7.078)} = .592 \text{ lbs. of fuel/BHP-hr}$$

(i) For dilute sampling systems which require conversion of as-measured dry concentrations to wet concentrations, the following equation shall be used for any combination of bagged, continuous, or fuel mass-approximated sample measurements (except for CO measurements made through conditioning columns, as explained in paragraph (d)(3) of this section):

Wet concentration = K_w × dry concentration

Where:

$$K_w = 1 - .00925\ CO_{2e}(\ ) - \left(\frac{1.608 \times H'}{7000 + H'}\right), \text{ or}$$

$$= 1 - .00925\ CO_{2e}(\ ) - \left(\frac{1.608 \times H'}{1000 + H'}\right)$$

for SI units.

$CO_{2e}(\ )$ = either CO_{2e} or CO_{2e}', as applicable.

H′ = Absolute humidity of the CVS dilution air in grains (grams) of water per pound (kilogram) of dry air.

$H' = [(43.478)R_i' \times P_d']/[P_B - (P_d' \times R_i'/100)]$, and

$= [(6.211)R_i' \times P_d']/[P_B - (P_d' \times R_i'/100)]$ for SI units.

R_i'=Relative humidity of the CVS dilution air, in percent.

P_d'=Saturated vapor pressure, in mm Hg (kPa) at the ambient dry bulb temperature of the CVS dilution air.

P_B=Barometric pressure, in mm Hg (kPa).

(Approved by the Office of Management and Budget under control number 2000-0390)

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48146, Dec. 10, 1984; 50 FR 10694, Mar. 15, 1985; 51 FR 24612, July 7, 1986; 52 FR 47876, Dec. 16, 1987]

§ 86.1342-90 Calculations; exhaust emissions.

(a) The final reported transient emission test results should be computed by using the following formula:

$$A_{WM}=\frac{(1/7)(g_C)+(6/7)(g_H)}{(1/7)(BHP-hr_C)+(6/7)(BHP-hr_H)}$$

Where:

(1) A_{WM}=Weighted mass emission level (HC, CO, CO_2, or NO_x) in grams per brake horsepower-hour and, if appropriate, the weighted mass organic material hydrocarbon equivalent, in grams per brake horsepower-hour.

(2) g_C=Mass emission level in grams or grams carbon mass equivalent, measured during the cold start test.

(3) g_H=Mass emission level in grams or grams carbon mass equivalent, measured during the hot start test.

(4) $BHP-hr_C$=Total brake horsepower-hour (brake horsepower integrated over time) for the cold start test.

(5) $BHP\text{-}hr_H$=Total brake horsepower-hour (brake horsepower integrated over time) for the hot start test.

(b) The mass of each pollutant for the cold start test and the hot start test for bag measurements and diesel continuously heated sampling system measurements is determined from the following equations:

(1) Hydrocarbon mass:

$HC_{mass}=V_{mix}\times Density_{HC}\times(HC_{conc}/10^6)$

(2) Oxides of nitrogen mass:

$NOx_{mass}=V_{mix}\times Density_{NO2}\times K_H\times(NOx_{conc}/10^6)$

(3) Carbon monoxide mass:

$CO_{mass}=V_{mix}\times Density_{CO}\times(CO_{conc}/10^6)$

(4) Carbon dioxide mass:

$CO_{2mass}=V_{mix}\times Density\ CO_2\times(CO_{2conc}/10^2)$

(5) Methanol mass:

$CH3OH_{mass}=V_{mix}\times Density_{CH3OH}\times(CH3OH_{conc}/10^6)$

(6) Formaldehyde mass:

$HCHO_{mass}=V_{mix}\times Density_{HCHO}\times(HCHO_{conc}/10^6)$

(7) Organic material hydrocarbon equivalent mass:

(i)

$$OMHCE=HC_{mass}+\frac{13.8756}{32.042}(CH_3OH_{mass})+\frac{13.8756}{30.0262}(HCHO_{mass})$$

(c) The mass of each pollutant for the cold start test and the hot start test for flow compensated sample systems is determined from the following equations:

$$(1)\ HC_{mass} = \sum_{i=1}^{n} \left[\frac{(HC_e)_i}{10^6} \times (V_{mix})_i \times (Density_{HC}) \times \Delta T\right] - \frac{HC_d}{10^6}\left(1 - \frac{1}{DF}\right) \times V_{mix} \times Density_{HC}$$

$$(2)\ NOx_{mass} = K_H \times \sum_{i=1}^{n} \left[\frac{(NOx_e)_i}{10^6} \times (V_{mix})_i \times Density_{NO_2} \times \Delta T\right] - K_H \times \frac{NOx_d}{10^6}\left(1 - \frac{1}{DF}\right) \times V_{mix} \times Density_{NO_2}$$

$$(3)\ CO_{mass} = \sum_{i=1}^{n} \left[\frac{(CO_e)_i}{10^6} \times (V_{mix})_i \times Density_{CO} \times \Delta T\right] - \frac{CO_d}{10^6}\left(1 - \frac{1}{DF}\right) \times V_{mix} \times Density_{CO}$$

$$(4)\ CO2_{mass} = \sum_{i=1}^{n} \left[\frac{(CO_{2e})_i}{10^6} \times (V_{mix})_i \times Density_{CO_2} \times \Delta T\right] - \frac{CO_{2d}}{10^6}\left(1 - \frac{1}{DF}\right) \times V_{mix} \times Density_{CO_2}$$

(d) Meaning of symbols:

(1)(i) HC_{mass} = Hydrocarbon emissions, in grams per test phase.

(ii) $Density_{HC}$ = Density of hydrocarbons = 16.33 g/ft^3 (0.5768 kg/m^3) for gasoline and the gasoline fraction of methanol-fuel, and may be used for petroleum and the petroleum fraction of methanol diesel fuel if desired, 16.42 g/ft^3 (0.5800 kg/m^3) for # 1 petroleum diesel fuel and 16.27 g/ft^3 (0.5746 kg/m^3) for #2 diesel, assuming an average carbon to hydrogen ratio of 1:1.85 for gasoline, 1:1.93 for #1 petroleum diesel fuel and 1:1.80 for #2 petroleum diesel fuel at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.

(iii)(A) HC_{conc} = Hydrocarbon concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent (i.e., equivalent propane × 3).

(B) $HC_{conc} = HC_e - HC_d(1-(1/DF))$

Where:

(iv)(A) HC_e=Hydrocarbon concentration of the dilute exhaust bag sample or, for diesel continuous heated sampling systems, average hydrocarbon concentration of the dilute exhaust sample as determined from the integrated HC traces, in ppm carbon equivalent. For flow compensated systems $(HC_e)_i$ is the instantaneous concentration.

(B) For petroleum-fueled engines, HC_e is the FID measurement.

(C) For methanol-fueled engines:

HC_e=FID $HC_e-(r)C_{CH3OHe}$

(v) FID HC_e=Concentration of hydrocarbon plus methanol in dilute exhaust as measured by the FID, ppm carbon equivalent.

(vi) r=FID response to methanol.

(vii) C_{CH3OHe}=Concentration of methanol in dilute exhaust as determined from the dilute exhaust methanol sample, ppm carbon.

(viii)(A) HC_d=Hydrocarbon concentration of the dilution air as measured, in ppm carbon equivalent.

(B) HC_d=FID $HC_d-(r)C_{CH3OHd}$

(ix) FID HC_d=Concentration of hydrocarbon plus methanol in dilution air as measured by the FID, ppm carbon equivalent.

(x) C_{CH3OHd}=Concentration of methanol in dilution air as determined from dilution air methanol sample in ppm carbon.

(2)(i) NOx_{mass}=Oxides of nitrogen emissions, in grams per test phase.

(ii) $Density_{NO2}$=Density of oxides of nitrogen is 54.16 g/ft^3 (1.913 kg/m^3), assuming they are in the form of nitrogen dioxide, at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.

(iii)(A) NOx_{conc}=Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, in ppm.

(B) $NOx_{conc}=NOx_e-NOx_d\ [1-(1/DF)]$

Where:

(iv) NOx_e=Oxides of nitrogen concentration of the dilute exhaust bag sample as measured, in ppm. For flow compensated sample systems $(NOx_e)_i$ is the instantaneous concentration.

(v) NOx_d=Oxides of nitrogen concentration of the dilution air as measured, in ppm.

(3)(i) CO_{mass}=Carbon monoxide emissions, grams per test phase.

(ii) $Density_{CO}$=Density of carbon monoxide is 32.97 g/ft^3 (1.164 kg/m^3), at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.

(iii)(A) CO_{conc}=Carbon monoxide concentration of the dilute exhaust sample corrected for background, water vapor, and CO_2 extraction, ppm.

(B) $CO_{conc}=CO_e-CO_d[1-(1/DF)]$

Where:

(iv) CO_e=Carbon monoxide concentration of the dilute exhaust bag sample volume corrected for water vapor and carbon dioxide extraction, in ppm. For flow compensated sample systems $(CO_e)_i$ is the instantaneous concentration.

(v)(A) $CO_e=(1-0.01925CO_{2e}--0.000323R)CO_{em}$ for gasoline and petroleum diesel fuel, with hydrogen to carbon ratio of 1.85:1.

(B) $CO_e=[1-(0.01+0.005HCR)CO_{2e}-0.000323R]\ CO_{em}$ for methanol fuel, where HCR is hydrogen to carbon ratio as measured for the fuel used.

Where:

(vi) CO_{em}=Carbon monoxide concentration of the dilute exhaust sample as measured, in ppm.

(vii)(A) CO_{2e}=Carbon dioxide concentration of the dilute exhaust bag sample, in percent, if measured. For flow compensated sample systems, $(CO_{2e})_i$ is the instantaneous concentration. For cases where exhaust sampling of CO_2 is not performed, the following approximation is permitted:

(B)

$$CO_{2e}=\frac{44.010}{12.011+(1.008^{\alpha})}\times\frac{M(453.6)}{\text{Density } CO_2}\times\frac{100}{V_{mix}}$$

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Where:

(C) α=Average carbon to hydrogen ratio, as specified by the Administrator.

(D) M′=Fuel mass consumed during the test cycle.

(E) R=Relative humidity of the dilution air, percent.

(viii)(A) CO_d=Carbon monoxide concentration of the dilution air corrected for water vapor extraction, in ppm.

(B) $CO_d=(1-0.000323R)CO_{dm}$.

Where:

(ix) CO_{dm}=Carbon monoxide concentration of the dilution air sample as measured, in ppm.

NOTE: If a CO instrument which meets the criteria specified in § 86.1311 is used and the conditioning column has been deleted, CO_{em} must be substituted directly for CO_e, and CO_{dm} must be substituted directly for CO_d.

(4)(i) CO_{2mass}=Carbon dioxide emissions, in grams per test phase.

(ii) Density CO_2=Density of carbon dioxide is 51.81 g/ft³ (1.830 kg/m³), at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.

(iii) CO_{2conc}=Carbon dioxide concentration of the dilute exhaust sample corrected for background, in percent.

(iv) $CO_{2mass}=CO_{2e}-CO_{2d}[1-(1/DF)]$.

Where:

(v) CO_{2d}=Carbon dioxide concentration of the dilution air as measured, in percent.

(5)(i) CH_3OH_{mass}=Methanol emissions corrected for background, in grams per test phase.

(ii) Density $_{CH3OH}$=Density of methanol is 37.71 g/ft³ (1.332 kg/m³), at 68 °F (20 °C) and 760 mm Hg (101.3kPa) pressure.

(iii)(A) CH_3OH_{conc}=Methanol concentration of the dilute exhaust corrected for background, in ppm.

(B) $CH_3OH_{conc}=C_{CH3OHe}-C_{CH3OHd}[1-(1/DF)]$.

Where:

(iv)(A) C_{CH3OHe}=Methanol concentration in the dilute exhaust, in ppm.

(B)

$$C_{CH3OHe}=\frac{3.813\times10^{-2}\times C_{CH3OHR}\times T_{EM}\,[(A_{S1}\times AV_{S1})+(A_{S2}\times AV_{S2})]}{A_{CH3OHR}\times P_B\times V_{EM}}$$

(v)(A) C_{CH3OHd}=Methanol concentration in the dilution air, in ppm.

(B)

$$C_{CH3OHd}=\frac{3.813\times10^{-2}\times C_{CH3OHR}\times T_{DM}\,[(A_{D1}\times AV_{D1})+(A_{D2}\times AV_{D2})]}{A_{CH3OHR}\times P_B\times V_{DM}}$$

(vi) C_{CH3OHR}=Concentration of methanol in standard sample for calibration of GC, µg/ml.

(vii) A_{CH3OHR}=GC peak area of standard sample.

(viii) T_{EM}=Temperature of methanol sample withdrawn from dilute exhaust, °R.

(ix) T_{DM}=Temperature of methanol sample withdrawn from dilution air, °R.

(x) P_B=Barometric pressure during test, mm Hg.

(xi) V_{EM}=Volume of methanol sample withdrawn from dilute exhaust, ft³.

(xii) V_{DM}=Volume of methanol sample withdrawn from dilution air, ft³.

(xiii) A_S=GC peak area of sample drawn from dilute exhaust.

(xiv) A_D=GC peak area of sample drawn from dilution air.

(xv) AV_S=Volume of absorbing reagent (deionized water) in impinger through which methanol sample from dilute exhaust is drawn, ml.

(xvi) AV_D=Volume of absorbing reagent (deionized water) in impinger through which methanol sample from dilution air is drawn, ml.

(xvii) 1=first impinger.

(xviii) 2=second impinger.

(6)(i) $HCHO_{mass}$=Formaldehyde emissions corrected for background, grams per test phase.

(ii) $Density_{HCHO}$=Density of formaldehyde is 35.36 g/ft^3 (1.249 kg/m^3), at 68 °F (20 °C) and 760 mmHg (101.3 kPa) pressure.

(iii)(A) $HCHO_{conc}$=Formaldehyde concentration of the dilute exhaust corrected for background, ppm.

(B) $HCHO_{conc}=C_{HCHOe}-C_{HCHOd}$ $[1-(1/DF)]$.

Where:

(iv)(A) C_{HCHOe}=Formaldehyde concentration in dilute exhaust, ppm.

(B)

$$C_{HCHOe}=\frac{4.069\times10^{-2}\times C_{FDE}\times V_{AE}\times Q\times T_{EF}}{V_{SE}\times P_B}$$

(v)(A) C_{HCHOd}=Formaldehyde concentration in dilution air, ppm.

(B)

$$C_{HCHOd}=\frac{4.069\times10^{-2}\times C_{FDA}\times V_{AA}\times Q\times T_{DF}}{V_{SA}\times P_B}$$

(vi) C_{FDE}=Concentration of DNPH derivative of formaldehyde from dilute exhaust sample in sampling solution, μg/ml.

(vii) V_{AE}=Volume of sampling solution for dilute exhaust formaldehyde sample, ml.

(viii)(A) Q=Ratio of molecular weights of formaldehyde to its DNPH derivative.

(B) Q=0.1429.

(ix) T_{EF}=Temperature of formaldehyde sample withdrawn from dilute exhaust, °R.

(x) V_{SE}=Volume of formaldehyde sample withdrawn from dilute exhaust, ft^3.

(xi) P_B=Barometric pressure during test, mm Hg.

(xii) C_{FDA}=Concentration of DNPH derivative of formaldehyde from dilution air sample in sampling solution, μg/ml.

(xiii) V_{AA}=Volume of sampling solution for dilution air formaldehyde sample, ml.

(xiv) T_{DF}=Temperature of formaldehyde sample withdrawn from dilution air, °R.

(xv) V_{SA}=Volume of formaldehyde sample withdrawn from dilution air, ft^3.

(7)(i) $DF=13.4/[CO_{2e}+(HC_e+CO_e)10^{-4}]$ for petroleum-fueled vehicles, or $DF=13.4/CO_{2e}$

$$\text{(ii)}\quad DF=\frac{100\ x\left(\dfrac{x}{x+y/2+3.76(x+y/4-z/2)}\right)}{CO_{2e}+\ (HC_e+CO_e+CH_3OH_e)\ 10^{-4}}$$

for methanol-fueled vehicles, where fuel composition is $C_xH_yO_z$ as measured for the fuel used.

(8)(i) K_H=Humidity correction factor.

(ii) For gasoline-fueled and methanol-fueled diesel engines: $K_H=1/[1-0.0047\ (H-75)]$ (or for SI units, $K_H=1/[1-0.0329(H-10.71)]$).

(iii) For petroleum-fueled and methanol-fueled diesel engines: $K_H=1/$

$[1-0.0026\ (H-75)]$ (or for SI units$=1/[1-0.0182\ (H-10.71)]$).

Where:

(iv)(A) H=Absolute humidity of the engine intake air in grains (grams) of water per pound (kilogram) of dry air.

(B)(*1*) $H=[(43.478)R_i\times P_d]/[P_B-(P_d\times R_i/100)]$

(*2*) *For SI units,*

$H=[(6.211)R_i\times P_d]/[P_B-(P_d\times R_i/100)]$

(C) R_i=Relative humidity of the engine intake air, percent.

(D) P_d= Saturated vapor pressure, in mm Hg (kPa) at the engine intake air dry bulb temperature.

(E) P_B=Barometric pressure, in mm Hg (kPa).

(9)(i) V_{mix}=Total dilute exhaust volume in cubic feet per test phase corrected to standard conditions (528 °R) (293 °K) and 760 mm Hg (101.3 kPa).

(ii) $(V_{mix})_i$=Instantaneous dilute exhaust volumetric flow rate (for compensated flow systems), ft³/sec.

(iii) T=Time interval (seconds) between samples in flow compensated systems.

(iv) T=Total sampling time (seconds).

(v) *For PDP-CVS:*

(A)

$$V_{mix}=V_o\times\left(\frac{N(P_B-P_4)(528)}{(760)(T_p)}\right)$$

(B) *For SI units,*

$$V_{mix}=V_o\times\left(\frac{N(P_B-P_4)(293)}{(101.3)(T_p)}\right)$$

Where:

(vi) V_o=Volume of gas pumped by the positive displacement pump, in cubic feet (cubic meters) per revolution. This volume is dependent on the pressure differential across the positive displacement pump.

(vii) N=Number of revolutions of the positive displacement pump during the test phase while samples are being collected.

(viii) P_B=Barometric pressure, mm Hg (kPa).

(ix) P_4=Pressure depression below atmospheric measured at the inlet to the positive displacement pump, in mm Hg (kPa) (during an idle mode).

(x) T_p=Average temperature of dilute exhaust entering positive displacement pump during test, °R (°K).

(e) Sample calculation of mass values of exhaust emissions:

(1) Assume the following test results for a gasoline engine:

	Cold start cycle test results	Hot start cycle test results
V_{mix}	6924 ft³	6873 ft³
R	30.2 percent	30.2 percent
R_i	30.2 percent	30.2 percent
P_B	735 mm Hq	735 mm Hg
P_d	22.676 mm Hq	22.676 mm Hq
HC_e	132.07 ppm C equiv	86.13 ppm C equiv
NO_{xe}	7.86 ppm	10.98 ppm
CO_{em}	171.22 ppm	114.28 ppm
CO_{2e}	0.178 percent	0.381 percent
HC_d	3.60 ppm C equiv	8.70 ppm C equiv
NO_d	0.0 ppm	0.10 ppm
CO_{dm}	0.89 ppm	0.89 ppm
CO_{2d}	0.0 percent	0.038 percent
BHP-hr	0.259	0.347

Then:

(2) *Cold Start Test:*

(i) H

$=[(43.478)(30.2)(22.676)]/[735-(22.676)(30.2)/100]$

=41 grains of water per pound of dry air.

(ii) $K_H=1/[1-0.0047(41-75)]=0.862$

(iii) CO_e

$=[1-0.01925(.178)-0.000323(30.2)]171.22$

=169.0 ppm

(iv) $CO_d=[1-0.000323(30.2)]\ 0.89=0.881$ ppm

(v) DF

$=13.4/[.178+(132.07+169.0)(10^{-4})]$

= 64.390

(vi) HC_{conc}

$=132.07-3.6[1-(1/64.390)]$

=128.5 ppm

(vii) HC_{mass}

$=6924(16.33)(128.5/10^6)$

=14.53 grams

(viii) NOx_{conc}

$=7.86-0.0[1-(1/64.390)]$

=7.86 ppm

(ix) NOx_{mass}

$=6924(54.16)(.862)(7.86/10^6)$

=2.54 grams

(x) CO_{conc}
$=169.0-.881[1-(1/64.390)]$
$=168.0$ ppm

(xi) CO_{mass}
$=6924(32.97)(168.0/10^6)$
$=38.35$ grams

(xii) $CO_{2conc}=.178-0[1-1/64.390)]=0.178\%$

(xiii) $CO_{2mass}=6924(51.81)(.178/100)=639$ grams

(3) *Hot start test:* Similar calculations result in the following:

(i) $HC_{mass}=8.72$ grams
(ii) $NOx_{mass}=3.49$ grams
(iii) $CO_{mass}=25.70$ grams
(iv) $CO_{2mass}=1226$ grams

(4) Weighted mass emission results:

(i) HC_{wm}

$$=\frac{1/7(14.53)+6/7(8.72)}{1/7(0.259)+6/7(0.347)}$$

$=28.6$ grams/BHP-hr

(ii) NOx_{wm}

$$=\frac{1/7(2.54)+6/7(3.49)}{1/7(0.259)+6/7(0.347)}$$

$=10.0$ grams/BHP-hr

(iii) CO_{wm}

$$=\frac{1/7(38.35)+6/7(25.70)}{1/7(0.259)+6/7(0.347)}$$

$=82.2$ grams/BHP-hr

(iv) CO_{2wm}

$$=\frac{1/7(639)+6/7(1226)}{1/7(0.259)+6/7(0.347)}$$

$=3415$ grams/BHP-hr

(f) The final reported brake-specific fuel consumption (BSFC) shall be computed by use of the following formula:

$$BSFC=\frac{1/7(M_C)+6/7(M_H)}{1/7(BHP-hr_C)+6/7(BHP-hr_H)}$$

Where:

(1) BSFC=brake-specific fuel consumption in pounds of fuel per brake horsepower-hour (lbs/BHP-hr).

(2) M_C=mass of fuel, in lbs, used by the engine during the cold start test.

(3) M_H=mass of fuel, in lbs, used by the engine during the hot start test.

(4) $BHP\text{-}hr_C$=total brake horsepower-hours (brake horsepower integrated with respect to time) for the cold start test.

(5) $BHP\text{-}hr_H$=total brake horsepower-hours (brake horsepower integrated with respect to time) for the hot start test.

(g)(1) The mass of fuel for the cold start and hot start test is determined from mass fuel flow measurements made during the tests, or from the following equation:

$M=(G_s/R_2)(1/453.6)$

(2) Meaning of symbols:

(i) M=Mass of fuel, in lbs, used by the engine during the cold or hot start test.

(ii) G_s=Grams of carbon measured during the cold or hot start test:

$$G_s=\left[\frac{12.011}{12.011+\alpha(1.008)}\right]HC_{mass}+0.429CO_{mass}+0.273CO_{2mass}$$

Where:

(iii) HC_{mass}=Hydrocarbon emissions, in grams, for cold or hot start test.

(iv) CO_{mass}=Carbon monoxide emissions, in grams, for cold or hot start test.

(v) CO_{2mass}=Carbon dioxide emissions, in grams, for cold or hot start test.

(vi) α=The atomic hydrogen to carbon ratio of the fuel.

(vii)(A) R_2=The grams of carbon in the fuel per gram of fuel.

(B) $R_2=12.011/[12.011+\alpha(1.008)]$

(h) Sample calculation of brake-specific fuel consumption:

(1) Assume the following test results:

	Cold start cycle test results	Hot start cycle test results
BHP-hr	6.945	7.078
α	1.85	1.85
HC_{mass} (grams)	37.08	28.82
CO_{mass} (grams)	357.69	350.33
CO_{2mass} (grams)	5,419.62	5,361.32

Then:

(i) G_s for cold start test=[12.011/(12.011+(1.008)(1.85))](37.08)+0.429(357.69)+0.273(5419.62)=1665.10 grams

(ii) G_s for hot start test=[12.011/(12.011+(1.008)(1.85))](28.82)+0.429(350.33)+0.273(5361.32)=1638.88 grams

(iii) $R_2=12.011/[12.011+(1.008)1.85]=0.866$

(iv)(A) $M_c=(1665.10/.866)(1/453.6)=4.24$ lbs (calculated), or

(B) =4.24 lbs (directly measured).

(v)(A) $M_H=(1638.88/.866)(1/453.6)$-04.17 lbs (calculated), or

(B) =4.17 lbs (directly measured).

(2) Brake-specific fuel consumption results:

$$\text{BSFC}=\frac{(1/7)(4.24)+(6/7)(4.17)}{(1/7)(6.945)+(6/7)(7.078)}=0.592 \text{ lbs of fuel/BHP-hr}$$

(i) For dilute sampling systems which require conversion of as-measured dry concentrations to wet concentrations, the following equation shall be used for any combination of bagged, continuous, or fuel mass-approximated sample measurements (except for CO measurements made through conditioning columns, as explained in paragraph (d)(3) of this section):

Wet concentration=K_w×dry concentration.

Where:

(ii)(A)

$$K_w=1-.00925CO_{2e}(')-\frac{1.608\times H'}{7000+H'}$$

(B) *For SI units,*

$$K_w=1-.00925CO_{2e}(')-\frac{1.608\times H'}{1000+H'}$$

(iii) $CO_{2e}(')$=either CO_{2e} or CO_{2e}' as applicable.

(iv)(A) H'=Absolute humidity of the CVS dilution air, in grains (grams) of water per lb (kg) of dry air.

(B) $H'=[(43.478)R_i'\times P_d']/[P_B-(P_d'\times R_i'/100)]$

(C) *For SI units,*

$H'=[(6.211)R_i'\times P_d']/[P_B-(P_d'\times R_i'/100)]$

(v) R_i'=Relative humidity of the CVS dilution air, in percent.

(vi) P_d=Saturated vapor pressure, in mm Hg (kPa) at the ambient dry bulb temperature of the CVS dilution air.

(vii) P_B=Barometric pressure, mm Hg (kPa).

[54 FR 14605, Apr. 11, 1989]

§ 86.1343-88 Calculations; particulate exhaust emissions.

(a) The final reported transient emission test results shall be computed by use of the following formula:

$$P_{wm}=\frac{1/7\ P_C+6/7\ P_H}{1/7\ BHP-hr_C+6/7BHP-hr_H}$$

(1) P_{wm}=Weighted mass particulate, grams per brake horsepower-hour.

(2) P_C=Mass particulate measured during the cold-start test, grams.

(3) P_H=Mass particulate measured during the hot-start test, grams.

(4) $BHP\text{-}hr_C$=Total brake horsepower-hour (brake horsepower integrated with respect to time) for the cold-start test.

(5) $BHP\text{-}hr_H$=Total brake horsepower-hour (brake horsepower integrated with respect to time) for the hot-start test.

(b) The mass of particulate for the cold-start test and the hot-start test is determined from the following equation when a heat exchanger is used (*i.e.*, no flow compensation), and when background filters are used to correct for background particulate levels:

$$P_{mass} = (V_{mix}+V_{sf})\times\left[\frac{P_f}{V_{sf}}-\left(\frac{P_{bf}}{V_{bf}}\times[1-(1/DF)]\right)\right]$$

(1) P_{mass}=Mass of particulate emitted per test phase, grams per test phase. ($P_H=P_{mass}$ for the hot-start test and $P_C=P_{mass}$ for the cold-start test.

(2) V_{mix}=Total dilute exhaust volume corrected to standard conditions (528°R (293°K) and 760 mm Hg (101.3 kPa)), cubic feet per test phase. For a PDP-CVS:

$$V_{mix} = V_o\times\frac{N\ (P_B-P_4)\ (528°R)}{(760\text{ mm }H_g)\ (T_p),}$$

in SI units,

$$V^{mix} = V_o\times\frac{N\ (P_B-P_4)\ (293°K)}{(101.3\text{ kPa})\ (T_p),}$$

Where:

(i) V_o=Volume of gas pumped by the positive displacement pump, cubic feet (cubic meters) per revolution. This volume is dependent on the pressure differential across the positive displacement pump.

(ii) N= Number of revolutions of the positive displacement pump during the test phase while samples are being collected.

(iii) P_B= Barometric pressure, mm Hg (kPa).

(iv) P_4= Pressure depressions below atmospheric measured at the inlet to the positive displacement pump (during an idle mode), mm Hg (kPa).

(v) T_p= Average temperature of dilute exhaust entering the positive displacement pump during test, °R (°K).

(3) V_{sf}= Total volume of sample removed from the primary dilution tunnel, cubic feet at standard conditions.

(i) For a single-dilution system:

$$V_{sf} = \frac{V_{as}\times(P_B+P_{is})\times 528°R}{T_{is}\times 760\text{ mm Hg},}$$

Where:

(A) V_{as}=Actual volume of dilute sample removed from the primary-dilution tunnel, cubic feet.

(B) P_B=Barometric pressure, mm Hg.

(C) P_{is}=Pressure elevation above ambient measured at the inlet to the dilute exhaust sample gas meter or flow instrumentation, mm Hg. (For most gas meters or flow instruments with unrestricted discharge, P_{is} is negligible and can be assumed = 0.)

(D) T_{is}=Average temperature of the dilute exhaust sample at the inlet to the gas meter or flow instrumentation, °R.

(E) V_{sf} may require correction according to § 86.1320-87(a)(6).

(ii) For a double-dilution system:

$$V_{sf}=V_{vf}-V_{pf}'$$

Where:

(A) $$V_{vf}=\frac{V_{av}\times(P_B+P_{iv})\times 528\ °R}{T_{iv}\times 760\text{ mm Hg}}$$

(B) V_{av}=Actual volume of double diluted sample which passed through the particulate filter, cubic feet.

(C) P_B=Barometric pressure, mm Hg.

(D) P_{iv}=Pressure elevation above ambient measured at the inlet to the sample gas meter located at the exit side of the secondary-dilution tunnel, mm Hg. (For most gas meters with unrestricted discharge P_{iv} is negligible and can be assumed = 0.)

(E) T_{iv}=Average temperature of the dilute exhaust sample at the inlet to the exit side gas meter or flow instrumentation, °R.

$$\text{(F)} \quad V_{pf}=\frac{V_{ap}\times(P_B+P_{ip})\times 528\ °R}{T_{ip}\times 760\ \text{mm Hg}}$$

(G) V_{ap}=Actual volume of secondary dilution air, cubic feet.
(H) P_B=Barometric pressure, mm Hg.
(I) P_{ip}=Pressure elevation above ambient measured at the inlet to the sample gas meter or flow instrumentation located at the inlet side of the secondary dilution tunnel, mm Hg. (For most gas meters with unrestricted discharge P_{ip} is negligible and can be assumed = 0.)
(J) T_{ip}=Average temperature of the secondary dilution air at the inlet to the inlet side gas meter or flow instrumentation, °R.
(K) Both V_{vf} and V_{pf} may require correction according to § 86.1320-87(a)(6). These corrections must be applied before V_{sf} is determined.
(4) P_f=Mass of particulate on the sample filter (or sample and back-up filters if the back-up filter is required to be included, see § 86.1339-87(g) for determination), grams per test phase.
(5) P_{bf}=Net weight of particulate on the background particulate filter, grams.

$$\text{(6)} \quad V_{bf}=\frac{V_{ab}\times(P_B+P_{ib})\times 528\ °R,}{T_{ib}\times 760\ \text{mm Hg}}$$

Where:
(i) V_{ab} = Actual volume of primary dilution air sampled by background particulate sampler, cubic feet.
(ii) P_{ib} = Pressure elevation above ambient measured at the inlet to the background gas meter or flow instrument, mm Hg. (for most gas meters or flow instruments with unrestricted discharge, P_{ib} is negligible and can be assumed = 0.)
(iii) T_{ib} = Average temperature of the background sample at the inlet to the gas meter or flow instrument, °R.

(7) For definition of DF see § 86.1342-84(d)(5).

(8)(i) Real time flow rate measurement and calculating devices are permitted under these regulations. The appropriate changes in the above calculations shall be made using sound engineering principles.

(ii) Other systems and options, as permitted under these regulations, may require calculations other than these, but these must be based on sound engineering principles and be approved in advance by the Administrator at the time the alternate system is approved.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10706, Mar. 15, 1985, as amended at 52 FR 47876, Dec. 16, 1987]

§ 86.1344-84 Required information.

(a) The required test data shall be grouped into the following three general categories:

(1) *Engine set-up and descriptive data.* This data must be provided to the EPA supervisor of engine testing for each engine sent to the Administrator for confirmatory testing prior to the initiation of engine set-up. This data is necessary to ensure that EPA test personnel have the correct data in order to set up and test the engine in a timely and proper manner. This data is not required for tests performed by the manufacturers.

(2) *Pre-test data.* This data is general test data that must be recorded for each test. The data is of a more descriptive nature such as identification of the test engine, test site number, etc. As such, this data can be recorded at any time within 24 hours of the test.

(3) *Test-data.* This data is physical test data that must be recorded at the time of testing.

(b) When requested, data shall be supplied in the format specified by the Administrator.

(c) *Engine set-up data.* Because specific test facilities may change with time, the specific data parameters and number of items may vary. The Application Format for Certification for the applicable Model Year will specify exact requirements. In general, the following type of data will be required:

(1) Engine manufacturer.

(2) Engine system combination.

(3) Engine code and CID.

(4) Engine identification number.

(5) Applicable engine model year.

(6) Engine fuel type.

(7) Recommended oil type.

(8) Exhaust pipe configuration, pipe sizes, etc.

(9) Curb idle speed.

(10) Dynamometer idle speed. (Automatic transmission engines only.)

(11) Engine parameter specification such as spark timing, operating temperature, advance curves, etc.

(12) Engine performance data such as maximum BHP, previously measured rated rpm, fuel consumption, governed speed, etc.

(13) Recommended start-up procedure.

(14) Maximum safe engine operating speed.

(15) Number of hours of operation accumulated on engine.

(16) Manufacturer's recommended inlet depression limit and typical in-use inlet depression level.

(17) Exhaust system.

(i) *Diesel engines.*

(A) Header pipe inside diameter.

(B) Tailpipe inside diameter.

(C) Minimum distance in-use between the exhaust manifold flange and the exit of the chassis exhaust system.

(D) Manufacturer's recommended maximum exhaust backpressure limit for the engine.

(E) Typical backpressure, as determined by typical application of the engine.

(F) Minimum backpressure required to meet applicable noise regulations.

(ii) *Gasoline-fueled engines.* Typical in-use backpressure in vehicle exhaust system.

(d) *Pre-test data.* The following data shall be recorded, and reported to the Administrator for each test conducted for Compliance with the provisions of 40 CFR Part 86, Subpart A:

(1) Engine-system combination.

(2) Engine identification.

(3) Instrument operator(s).

(4) Engine operator(s).

(5) Number of hours of operation accumulated on the engine prior to beginning the test sequence (Figure N84-10).

(6) Fuel identification, fuel specifications of test fuel used.

(7) Date of most recent analytical assembly calibration.

(8) All pertinent instrument information such as tuning, gain, serial numbers, detector number, calibration curve number, etc. As long as this information is traceable, it may be summarized by system number or analyzer identification numbers.

(e) *Test data.* The physical parameters necessary to compute the test results and ensure accuracy of the results shall be recorded for each test conducted for compliance with the provisions of 40 CFR Part 86, Subpart A. Additional test data may be recorded at the discretion of the manufacturer. Extreme details of the test measurements such as analyzer chart deflections will generally not be required on a routine basis to be reported to the Administrator for each test, unless a dispute about the accuracy of the data arises. The following type of data shall be required to be reported to the Administrator. The Application Format for Certification for the applicable Model Year will specify the exact requirements which may change slightly from year to year with the addition or deletion of certain items.

(1) Date and time of day.

(2) Test number.

(3) Engine intake air or test cell temperature.

(4) Barometric pressure.

NOTE: A central laboratory barometer may be used; *Provided*, That individual test cell barometric pressure are shown to be within ±0.1 percent of the barometric pressure at the central barometer location.

(5) Engine intake or test cell and CVS dilution air humidity.

(6) Maximum torque versus speed curve as determined in § 86.1332-84, with minimum and maximum engine speeds, and a description of the mapping technique used.

(7) Measured maximum horsepower and maximum torque speeds.

(8) Measured maximum horsepower and torque.

(9) Measured high idle engine speed (governed diesel engines only).

(10) Measured fuel consumption at maximum power and torque (diesel engines only).

(11) Cold soak time interval and cool down procedures.

(12) Temperature set point of the heated continuous analysis system components (if applicable).

(13) Test cycle validation statistics as specified in § 86.1341-84 for each test phase (cold-hot).

(14) Total CVS flow rate with dilution factor for each test phase (cold-hot).

(15) Sample concentrations (background corrected) for HC, CO, CO_2, and NO_x for each test phase (cold-hot).

(16) Brake specific emissions (g/BHP-hr) for HC, CO and NO_x for each test phase (cold-hot).

(17) The weighted (cold-hot) brake specific emissions (g/BHP-hr) for the total test.

(18) The weighted (cold-hot) carbon balance or mass-measured brake specific fuel consumption for the total test.

(19) The number of hours of operation accumulated on the engine after completing the test sequences described in Figure N84-10.

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52210, Nov. 16, 1983, as amended at 49 FR 48148, Dec. 10, 1984]

§ 86.1344-88 Required information.

(a) The required test data shall be grouped into the following three general categories:

(1) *Engine set-up and descriptive data.* This data must be provided to the EPA supervisor of engine testing for each engine sent to the Administrator for confirmatory testing prior to the initiation of engine set-up. This data is necessary to ensure that EPA test personnel have the correct data in order to set up and test the engine in a timely and proper manner. This data is not required for tests performed by the manufacturers.

(2) *Pre-test data.* This data is general test data that must be recorded for each test. The data is of a more descriptive nature such as identification of the test engine, test site number, etc. As such, this data can be recorded at any time within 24 hours of the test.

(3) *Test data.* This data is physical test data that must be recorded at the time of testing.

(b) All data may be supplied to the Administrator by punch cards, magnetic tape, or other electronic data processing means. Acceptable data formats and transmission techniques will be provided in the Application Format for Certification of the applicable model year.

(c) *Engine set-up data.* Because specific test facilities may change with time, the specific data parameters and number of items may vary. The Application Format for Certification for the applicable model year will specify the exact requirements. In general, the following types of data will be required:

(1) Engine manufacturer.

(2) Engine system combination.

(3) Engine code and CID.

(4) Engine identification number.

(5) Applicable engine model year.

(6) Engine fuel type.

(7) Recommended oil type.

(8) Exhaust pipe configuration, pipe sizes, etc.

(9) Curb or low idle speed.

(10) Dynamometer idle speed. (Automatic transmission engines only.)

(11) Engine parameter specifications such as spark timing, operating temperature, advance curves, etc.

(12) Engine performance data, such as maximum BHP, previously measured rated rpm, fuel consumption, governed speed, etc.

(13) Recommended start-up procedure.

(14) Maximum safe engine operating speed.

(15) Number of hours of operation accumulated on engine.

(16) Manufacturer's recommended inlet depression limit and typical in-use inlet depression level.

(17) Exhaust system.

(i) *Diesel engines.*

(A) Header pipe inside diameter.

(B) Tailpipe inside diameter.

(C) Minimum distance in-use between the exhaust manifold flange and the exit of the chassis exhaust system.

(D) Manufacturer's recommended maximum exhaust backpressure limit for the engine.

(E) Typical backpressure as determined by typical application of the engine.

(F) Minimum backpressure required to meet applicable noise regulations.

(ii) *Gasoline-fueled engines.* Typical in-use backpressure in vehicle exhaust system.

(d) *Pre-test data.* The following data shall be recorded, and reported to the Administrator for each test conducted for compliance with the provisions of 40 CFR Part 86, Subpart A:

(1) Engine-system combination.

(2) Engine identification.

(3) Instrument operator(s).

(4) Engine operator(s).

(5) Number of hours of operation accumulated on the engine prior to beginning the test sequence (Figure N84-10).

(6) Identification and specifications of test fuel used.

(7) Date of most recent analytical assembly calibration.

(8) All pertinent instrument information such as tuning, gain, serial numbers, detector number, calibration curve number, etc. As long as this information is traceable, it may be summarized by system number or analyzer identification numbers.

(e) *Test data.* The physical parameters necessary to compute the test results and ensure accuracy of the results shall be recorded for each test conducted for compliance with the provisions of 40 CFR Part 86, Subpart A. Additional test data may be recorded at the discretion of the manufacturer. Extreme details of the test measurements such as analyzer chart deflections will generally not be required on a routine basis to be reported to the Administrator for each test, unless a dispute about the accuracy of the data arises. The following types of data shall be required to be reported to the Administrator. The Application Format for Certification for the applicable model year will specify the exact requirements which may change slightly from year to year with the addition or deletion of certain items.

(1) Date and time of day.

(2) Test number.

(3) Engine intake air or test cell temperature.

(4) *Barometric pressure.* (A central laboratory barometer may be used: *Provided,* That individual test cell barometric pressure are shown to be within ±0.1 percent of the barometric pressure at the central barometer location.

(5) Engine intake or test cell and CVS dilution air humidity.

(6) Maximum torque versus speed curve as determined in § 86.1332-84, with minimum and maximum engine speeds, and a description of the mapping technique used.

(7) Measured maximum horsepower and maximum torque speeds.

(8) Measured maximum horsepower and torque.

(9) Measured high idle engine speed (governed diesel engines only).

(10) Measured fuel consumption at maximum power and torque (diesel engines only).

(11) Cold-soak time interval and cool down procedures.

(12) Temperature set point of the heated continuous analysis system components (if applicable).

(13) Test cycle validation statistics as specified in § 86.1341-84 for each test phase (cold and hot).

(14) Total CVS flow rate with dilution factor for each test phase (cold and hot).

(15) Temperature of the dilute exhaust mixture and secondary dilution air (in the case of a double dilution system) at the inlet to the respective gas meter(s) or flow instrumentation used for particulate sampling (diesels only).

(16) The maximum temperature of the dilute exhaust mixture immediately before the particulate filter (diesels only).

(17) Sample concentrations (background corrected) for HC, CO, CO_2, and NO_x for each test phase (cold and hot).

(18) The stabilized pre-test weight and post-test weight of each particulate sample and back-up filter or pair of filters (diesels only).

(19) Brake specific emissions (g/BHP-hr) for HC, CO and NO_x for each test phase (cold and hot).

(20) The weighted (cold and hot) brake specific emissions (g/BHP-hr) for the total test.

(21) The weighted (cold and hot) carbon balance or mass-measured brake specific fuel consumption for the total test.

(22) The number of hours of operation accumulated on the engine after completing the test sequences described in Figure N84-10.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10707, Mar. 15, 1985]

§ 86.1344-90 Required information.

(a) The required test data shall be grouped into the following three general categories:

(1) *Engine set up and descriptive data.* These data must be provided to the EPA supervisor of engine testing for each engine sent to the Administrator for confirmatory testing prior to the initiation of engine set-up. These data are necessary to ensure that EPA test personnel have the correct data in order to set up and test the engine in a timely and proper manner. These data are not required for tests performed by the manufacturers.

(2) *Pre-test data.* These data are general test data that must be recorded for each test. The data are of a more descriptive nature such as identification of the test engine, test site number, etc. As such, these data can be recorded at any time within 24 hours of the test.

(3) *Test data.* These data are physical test data that must be recorded at the time of testing.

(b) When requested, data shall be supplied in the format specified by the Administrator.

(c) *Engine set-up data.* Because specific test facilities may change with time, the specific data parameters and number of items may vary. The Application Format for Certification for the applicable model year will specify the exact requirements. In general, the following types of data will be required:

(1) Engine manufacturer.

(2) Engine system combination.

(3) Engine code and CID.

(4) Engine identification number.

(5) Applicable engine model year.

(6) Engine fuel type.

(7) Recommended oil type.

(8) Exhaust pipe configuration, pipe sizes, etc.

(9) Curb or low idle speed.

(10) Dynamometer idle speed. (Automatic transmission engines only.)

(11) Engine parameter specifications such as spark timing, operating temperature, advance curves, etc.

(12) Engine performance data, such as maximum BHP, previously measured rated rpm, fuel consumption, governed speed, etc.

(13) Recommended start-up procedure.

(14) Maximum safe engine operating speed.

(15) Number of hours of operation accumulated on engine.

(16) Manufacturer's recommended inlet depression limit and typical in-use inlet depression level.

(17) Exhaust system:

(i) *Petroleum-fueled and methanol-fueled diesel engines:*

(A) Header pipe inside diameter.

(B) Tailpipe inside diameter.

(C) Minimum distance in-use between the exhaust manifold flange and the exit of the chassis exhaust system.

(D) Manufacturer's recommended maximum exhaust backpressure limit for the engine.

(E) Typical backpressure, as determined by typical application of the engine.

(F) Minimum backpressure required to meet applicable noise regulations.

(ii) *Gasoline-fueled and methanol-fueled Otto-cycle engines:* Typical in-use backpressure in vehicle exhaust system.

(d) *Pre-test data.* The following data shall be recorded, and reported to the Administrator for each test conducted for compliance with the provisions of CFR Part 86, Subpart A:

(1) Engine-system combination.

(2) Engine identification.

(3) Instrument operator(s).

(4) Engine operator(s).

(5) Number of hours of operation accumulated on the engine prior to beginning the test sequence (Figure N84-10).

(6) Identification and specifications of test fuel used.

(7) Date of most recent analytical assembly calibration.

(8) All pertinent instrument information such as tuning, gain, serial numbers, detector number, calibration

curve number, etc. As long as this information is traceable, it may be summarized by system or analyzer identification numbers.

(e) *Test data.* The physical parameters necessary to compute the test results and ensure accuracy of the results shall be recorded for each test conducted for compliance with the provisions of 40 CFR Part 86, Subpart A. Additional test data may be recorded at the discretion of the manufacturer. Extreme details of the test measurements such as analyzer chart deflections will generally not be required on a routine basis to be reported to the Administrator for each test, unless a dispute about the accuracy of the data arises. The following types of data shall be required to be reported to the Administrator. The Application Format for Certification for the applicable model year will specify the exact requirements which may change slightly from year to year with the addition or deletion of certain items.

(1) Date and time of day.

(2) Test number.

(3) Engine intake air or test cell temperature.

(4) Barometric pressure. (A central laboratory barometer may be used: *Provided,* that individual test cell barometric pressures are shown to be within ±0.1 percent of the barometric pressure at the central barometer location.)

(5) Engine intake or test cell and CVS dilution air humidity.

(6) Maximum torque versus speed curve as determined in § 86.1332, with minimum and maximum engine speeds, and a description of the mapping technique used.

(7) Measured maximum horsepower and maximum torque speeds.

(8) Measured maximum horsepower and torque.

(9) Measured high idle engine speed (governed petroleum-fueled and methanol-fueled diesel engines only).

(10) Measured fuel consumption at maximum power and torque (petroleum-fueled and methanol-fueled diesel engines only).

(11) Cold-soak time interval and cool down procedures.

(12) Temperature set point of the heated continuous analysis system components (if applicable).

(13) Test cycle validation statistics as specified in § 86.1341 for each test phase (cold and hot).

(14) Total CVS flow rate with dilution factor for each test phase (cold and hot).

(15) Temperature of the dilute exhaust mixture and secondary dilution air (in the case of a double dilution system) at the inlet to the respective gas meter(s) or flow instrumentation used for particulate sampling.

(16) The maximum temperature of the dilute exhaust mixture immediately ahead of the particulate filter.

(17) Sample concentrations (background corrected) for HC, CO, CO_2, and NO_x for each test phase (cold and hot).

(18) *For methanol-fueled vehicles:*

(i) Volume of sample passed through the methanol sampling system and the volume of deionized water in each impinger.

(ii) The methanol concentration in the reference sample and the peak area from the GC analysis of the reference sample.

(iii) The peak area of the GC analyses of the test samples (methanol).

(iv) Volume of sample passed through the formaldehyde sampling system.

(v) The formaldehyde concentration in the reference sample and the peak area from the LC analysis of the reference sample.

(vi) The peak area of the LC analysis of the test sample (formaldehyde).

(vii) Specification of the methanol-fuel used during testing.

(19) The stabilized pre-test weight and post-test weight of each particulate sample and back-up filter or pair of filters.

(20) Brake specific emissions (g/BHP-hr) for HC, CO, NO_x and, if applicable, OMHCE, CH_3OH and HCHO for methanol-fueled vehicles for each test phase (cold and hot).

(21) The weighted (cold and hot) brake specific emissions (g/BHP-hr) for the total test.

(22) The weighted (cold and hot) carbon balance or mass-measured

brake specific fuel consumption for the total test.

(23) The number of hours of operation accumulated on the engine after completing the test sequences described in Figure N84-10.

[54 FR 14610, Apr. 11, 1989]

Subpart O—[Reserved]

Subpart P—Emission Regulations for New Gasoline-Fueled and Methanol-Fueled Otto-Cycle Heavy-Duty Engines and New Gasoline-Fueled and Methanol-Fueled Otto-Cycle Light-Duty Trucks; Idle Test Procedures

AUTHORITY: Secs. 202, 206, 207, 208, 301(a), Clean Air Act, as amended 42 U.S.C. 7521, 7525, 7541, 7542, and 7601.

SOURCE: 48 FR 52252, Nov. 16, 1983, unless otherwise noted.

§ 86.1501-84 Scope, applicability.

This subpart contains gaseous idle test procedures for 1984 and later model year gasoline-fueled light-duty trucks and 1987 and later model year gasoline-fueled heavy-duty engines utilizing aftertreatment technology.

[49 FR 48148, Dec. 10, 1984]

§ 86.1501-90 Scope; applicability.

This subpart contains gaseous emission idle test procedures for gasoline-fueled and methanol-fueled Otto-cycle heavy-duty engines, and for gasoline-fueled and methanol-fueled Otto-cycle light-duty trucks. It applies to 1990 and later model years.

[54 FR 14611, Apr. 11, 1989]

§ 86.1502-84 Definitions.

The definitions in § 86.084-2 apply to this subpart.

§ 86.1503-84 Abbreviations.

The abbreviations in § 86.084-3 apply to this subpart.

§ 86.1504-84 Section numbering; construction.

(a) The model year of initial applicability is indicated by the section number. The two digits following the hyphen designate the first model year for which a section is effective. A section remains effective until superseded.

Example: Section 86.1511-84 applies to the 1984 and subsequent model years until superseded. If § 86.1511-85 is promulgated, it would take effect beginning with the 1985 model year; § 86.1511-83 would apply to model years 1983 and 1984.

(b) A section reference without a model year suffix refers to the section applicable for the appropriate model year.

(c) All provisions in this subpart apply to gasoline-fueled heavy-duty engines and gasoline-fueled light-duty trucks.

§ 86.1504-90 Section numbering; construction.

(a) The model year of initial applicability is indicated by the section number. The two digits following the hyphen designate the first model year for which a section is effective. A section remains effective until superseded.

Example: Section 86.1511-84 applies to the 1984 and subsequent model years until superseded. If § 86.1511-85 is promulgated, it would take effect beginning with the 1985 model year. Section 86.1511-83 would apply to model years 1983 and 1984.

(b) A section reference without a model year suffix refers to the section applicable for the appropriate model year.

(c) All provisions in this subpart apply to gasoline-fueled and methanol-fueled Otto-cycle heavy-duty engines, and to gasoline-fueled and methanol-fueled Otto-cycle light-duty trucks.

[54 FR 14611, Apr. 11, 1989]

§ 86.1505-84 Introduction; structure of subpart.

(a) This subpart describes the equipment and the procedures required to perform idle exhaust emission tests on gasoline-fueled heavy-duty engines and gasoline-fueled light-duty trucks. Subpart A sets forth the testing requirements, reporting requirements and test intervals necessary to comply with EPA certification procedures.

(b) Four topics are addressed in this subpart. §§ 86.1505-84 through 86.1515-84 set forth specifications and equipment requirements; §§ 86.1516-84 through 86.1526-84 discuss calibration methods and frequency; test procedures and data requirements are listed in §§ 86.1527-84 through 86.1542-84; and calculation formulae are found in § 86.1544-84.

§ 86.1505-90 Introduction; structure of subpart.

(a) This subpart describes the equipment and the procedures required to perform idle exhaust emission tests on gasoline-fueled and methanol-fueled Otto-cycle heavy-duty engines, and gasoline-fueled and methanol-fueled Otto-cycle light-duty trucks. Subpart A sets forth the testing requirements, reporting requirements and test intervals necessary to comply with EPA certification procedures.

(b) Four topics are addressed in this subpart. Sections 86.1505 through 86.1515 set forth specifications and equipment requirement; §§ 86.1516 through 86.1526 discuss calibration methods and frequency; test procedures and data requirements are listed in §§ 86.1527 through 86.1542 and calculation formula are found in § 86.1544.

[54 FR 14611, Apr. 11, 1989]

§ 86.1506-84 Equipment required and specifications; overview.

(a) This subpart contains procedures for performing idle exhaust emission tests on gasoline-fueled heavy-duty engines and gasoline-fueled light-duty trucks. Equipment required and specifications are as follows:

(1) *Exhaust emission tests.* All engines and vehicles subject to this subpart are tested for exhaust emissions. Necessary equipment and specifications appear in §§ 86.1509-84 through 86.1511-84.

(2) *Fuel and analytical tests.* Fuel requirements for idle exhaust emission testing are specified in § 86.1513-84. Analytical gases are specified in § 86.1514-84.

§ 86.1506-90 Equipment required and specifications; overview.

(a) This subpart contains procedures for performing idle exhaust emission tests on gasoline-fueled and methanol-fueled Otto-cycle heavy-duty engines, and gasoline-fueled and methanol-fueled Otto-cycle light-duty trucks. Equipment required and specifications are as follows:

(1) *Exhaust emission tests.* All engines and vehicles subject to this subpart are tested for exhaust emissions. Necessary equipment and specifications appear in §§ 86.1509 through 86.1511.

(2) *Fuel and analytical tests.* Fuel requirements for idle exhaust emission testing are specified in § 86.1513. Analytical gases are specified in § 86.1514.

[54 FR 14612, Apr. 11, 1989]

§ 86.1509-84 Exhaust gas sampling system.

(a) The exhaust gas sampling system shall transport the exhaust sample from the engine or vehicle to the analysis system in such a manner as to maintain the integrity of the sample constituents that are to be analyzed.

(b) The sample system shall supply a dry sample (i.e., water removed) to the analysis system.

(c) A CVS sampling system with bag analysis as specified in § 86.1309-84 or § 86.109-82 is permitted. The inclusion of an additional raw carbon dioxide (CO_2) analyzer as specified in §§ 86.309-79 and 86.316-79 is required if the CVS system is used, in order to accurately determine the CVS dilution factor. The heated sample line specified in § 86.309-79 and § 86.310-79 for raw emission requirements is not required for the raw CO_2 measurement.

(d) A raw exhaust sampling system as specified in § 86.309-79 and § 86.310-79 is permitted.

§ 86.1511-84 Exhaust gas analysis system.

(a) Analyzers used for this subpart shall meet the following specifications:

(1) The analyzers used must have a range such that the carbon monoxide (CO) idle standard specified in § 86.084-10 for heavy-duty engines or specified in § 86.084-9 for light-duty trucks will provide an analyzer response between 45 and 90 percent of

full-scale deflection on the CO analyzer.

(2) The resolution of the readout device(s) for the range specified in paragraph (a)(1) of this section shall be equal to or less than 0.05 percent for the CO analyzer.

(3) For the range specified in paragraph (a)(1) of this section, the precision shall be less than ±3 percent of full-scale deflection. The precision is defined as two times the standard deviation of five repetitive responses to a given calibration gas.

(4) For the range specified in paragraph (a)(1) of this section, the mean response to a zero calibration gas shall not exceed ±3 percent of full-scale deflection during a 1-hour period.

(5) For the range specified in paragraph (a)(1) of this section the drift of the mean calibration response shall be less than ±3 percent of full scale during a 1-hour period. The calibration response is defined as the analyzer response to a calibration gas after the analyzer has been spanned by the electrical spanning network at the beginning of the 1-hour period.

(6) The analyzer must respond to an instantaneous step change at the entrance to the sampling system with a response equal to 90 percent of that step change within 15 seconds or less on the range specified in paragraph (a)(1) of this section. The step change shall be at least 60 percent of full-scale deflection.

(7) The interference gases listed shall individually or collectively produce an analyzer reading less than ±2 percent of full scale on the range specified in paragraph (a)(1) of this section.

Interference gas	Concentration	Applicable analyzer
CO_2	14 percent	CO
C_3H_8	1 percent	CO
H_2O	Saturated vapor at 100°F	CO
NO_x	1,000 ppm	CO
O_2	5 percent	CO

(8) The analyzer shall be able to meet the specifications in paragraph (a) of this section under the following conditions:

(i) After a 30 minute warm-up from the prevailing ambient conditions;

(ii) Between 0 to 85 percent relative humidity; and

(iii) During flow variations of ±50 percent.

(b) The inclusion of a raw CO_2 analyzer as specified in § 86.309-79 and § 86.316-79 is required in order to accurately determine the CVS dilution factor.

§ 86.1513-84 Fuel specifications.

The requirements of this section are set forth in § 86.1313-84(a) for heavy-duty engines, and in § 86.113-82(a) for light-duty trucks.

§ 86.1513-87 Fuel specifications.

The requirements of this section are set forth in § 86.1313-87(a) for heavy-duty engines, and in § 86.113-87(a) for light-duty trucks.

[51 FR 24613, July 7, 1986]

§ 86.1513-90 Fuel specifications.

The requirements of this section are set forth in § 86.1313-90(a) for heavy-duty engines, and in § 86.113-90(a) for light-duty trucks.

[53 FR 478, Jan. 7, 1988]

§ 86.1514-84 Analytical gases.

(a) The final idle emission test results shall be reported as percent for carbon monoxide on a dry basis.

(b) If the raw CO sampling system in § 86.309-79 is used, the analytical gases specified in § 86.308-79 shall be used.

[48 FR 52252, Nov. 16, 1983, as amended at 51 FR 24613, July 7, 1986]

§ 86.1516-84 Calibration; frequency and overview.

(a) Calibrations shall be performed as specified in §§ 86.1518-84 through 86.1526-84.

(b) At least monthly or after any maintenance which could alter calibration, check the calibration of the CO analyzer. Adjust or repair the analyzer as necessary.

(c) Water traps, filters, or conditioning columns should be checked before each test.

§ 86.1519-84 CVS calibration.

If the CVS system is used for sampling during the idle emission test, the calibration instructions are specified in § 86.1319-84 for heavy-duty engines, and § 86.119-78 for light-duty trucks.

§ 86.1522-84 Carbon monoxide analyzer calibration.

(a) *Initial check.* (1) Follow good engineering practice for instrument start-up and operation. Adjust the analyzer to optimize performance on the range specified in § 86.1511-84(a)(1).

(2) Calibrate the analyzer with the calibration gas specified in § 86.1514-84.

(3) Adjust the electrical span network such that the electrical span point is correct when the analyzer reads the calibration gas correctly.

(4) Determine that the analyzer complies with the specifications in § 86.1511-84.

(b) *Periodic check.* Follow paragraphs (a) (1), (2), and (3) of this section as specified by § 86.1516-84(b). Adjust or repair the analyzer as necessary.

§ 86.1524-84 Carbon dioxide analyzer calibration.

(a) The calibration requirements for the dilute-sample CO_2 analyzer are specified in § 86.1324-84 for heavy-duty engines and § 86.124-78 for light-duty trucks.

(b) The calibration requirements for the raw CO_2 analyzer are specified in § 86.330-79.

§ 86.1526-84 Calibration of other equipment.

Other test equipment used for testing shall be calibrated as often as necessary according to good engineering practice.

§ 86.1527-84 Idle test procedure; overview.

(a) The idle emission test procedure is designed to determine the raw concentration (in percent) of CO in the exhaust flow at idle. The test procedure begins with the engine at normal operating temperature. (For example, the warm-up for an engine may be the transient engine or chassis dynamometer test.)

(b) Raw emission sampling must be made before dilution occurs from a single exhaust pipe in which exhaust products are homogeneously mixed. The configuration for dual-exhaust systems must also allow for raw emission measurements, which will require that an additional "Y" pipe be placed in the exhaust system before dilution.

§ 86.1530-84 Test sequence; general requirements.

(a) The following test sequence lists the major steps encountered during the idle test:

Preparation
Warm-up (or Emission Test)
Preconditioning, 30 seconds minimum, six minutes maximum
Idle Stabilization, 30±5 seconds
Idle Emission Sampling, one minute minimum, six minutes maximum

These steps are described by subsequent procedures.

(b) Ambient test cell conditions during the test shall be those specified in § 86.1330-84 or § 86.130-78.

§ 86.1537-84 Idle test run.

The following steps shall be taken for each test:

(a) Check the device(s) for removing water from the exhaust sample and the sample filter(s). Remove any water from the water trap(s). Clean and replace the filter(s) as necessary.

(b) Set the zero and span points of the CO analyzer with the electrical spanning network or with analytical gases.

(c) Achieve normal engine operating condition. The transient engine or chassis dynamometer test is an acceptable technique for warm-up to normal operating condition for the idle test. If the emission test is not performed prior to the idle emission test, a heavy-duty engine may be warmed-up according to § 86.1332-84(d)(2) (i) through (iv). A light-duty truck may be warmed up by operation through one Urban Dynamometer Driving Schedule test procedure (see § 86.115-78 and Appendix I to this part).

(d) Operate the warm engine at 2500 ±50 rpm and zero load for a minimum of 30 seconds and a maximum of 6 minutes.

(e) If the CVS sampling system is used, the following procedures apply:

(1) With the sample selector valves in the "standby" position, connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(2) Start the CVS (if not already on), the sample pumps, and the raw CO_2 analyzer. (The heat exchanger of the constant volume sampler, if used, shall be running at operating temperature before sampling begins.)

(3) Adjust the sample flow rates to the desired flow rate and set the gas flow measuring devices to zero.

(4) Operate the engine or vehicle at curb idle for 30 ± 5 seconds with the clutch disengaged or in neutral gear. A heavy-duty engine may also be disconnected from the dynamometer; or the dynamometer may be shut off.

(5) Begin CO bag sampling and raw CO_2 sampling.

(6) Sample idle emissions long enough to obtain a sufficient bag sample, but in no case shorter than 60 seconds nor longer than 6 minutes. Follow the sampling and exhaust measurements requirements of § 86.340-79(e) for the conducting of the raw CO_2 measurement.

(7) As soon as possible, tranfer the idle test exhaust and dilution air samples to the analytical system and process the samples according to § 86.1540-84. Obtain a stabilized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(f) If the raw exhaust sampling and analysis technique specified in § 86.309-79 is used, the following procedures apply:

(1) Warm up the engine or vehicle per paragraphs (c) and (d) of this section. Operate the engine or vehicle at the conditions specified in paragraph (e)(4) of this section.

(2) Follow the sampling and exhaust measurement requirements of § 86.340-79(e). The idle sample shall be taken for 60 seconds minimum and no more than 64 seconds. The chart reading procedures of § 86.343-79 shall be used to determine the analyzer response.

(g) If the engine or vehicle stalls at any time during the test run, the test is void.

§ 86.1540-84 Idle exhaust sample analysis.

(a) Record the CO idle concentrations in percent.

(b) If the CVS sampling system is used, the analysis procedures for dilute CO and CO_2 specified in § 86.1340-84 apply. Follow the raw CO_2 analysis procedure specified in § 86.343-79 for the raw CO_2 analyzer.

(c) If the continuous raw exhaust sampling technique (§ 86.309-79) is used, the analysis procedures for CO specified in § 86.343-79 apply.

§ 86.1542-84 Information required.

(a) *General data—heavy-duty engines.* Information shall be recorded for each idle emission test as specified in § 86.1344-84 (b), (c), and (d). The following test data is required:

(1) Date and time of day.

(2) Test number.

(3) Engine intake air or test cell temperature.

(4) Barometric pressure.

NOTE: A central laboratory barometer may be used: *Provided*, That individual test cell barometric pressures are shown to be within ±0.1 percent of the barometric pressure at the central barometer location.

(5) Engine intake or test cell and CVS dilution air humidity.

(6) Curb idle speed during the test.

(7) Idle exhaust CO concentration (dry basis).

(8) Idle exhaust raw CO_2 concentration (if applicable).

(9) Dilute bag sample CO and CO_2 concentrations (if applicable).

(10) Total CVS flow rate with calculated dilution factor for the idle mode (if applicable).

(b) *General data—light-duty trucks.* The following information shall be recorded with respect to each test:

(1) Test number.

(2) System or device tested (brief description).

(3) Date and time of day for the test.

(4) Instrument operated.

(5) Vehicle: ID number, manufacturer, model year, standards, engine family, evaporative emissions family, basic engine description (including dis-

placement, number of cylinders, turbocharger used and catalyst usage), fuel system (including number of carburetors, number of carburetor barrels, fuel injection type and fuel tank(s) capacity and location), engine code, gross vehicle weight rating, inertia weight class and transmission configuration, as applicable.

(6) All pertinent instrument information such as tuning, gain, serial number, detector number and range. As an alternative a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(7) Recorder charts or computer printouts: Identify zero, span, exhaust gas and dilution air sample traces or computer readings (if applicable).

(8) Test cell ambient temperature and, if applicable, barometric pressure and humidity.

NOTE: A central laboratory barometer may be used: *Provided*, That individual test cell barometric pressures are shown to be within +0.1 percent of the barometric pressure at the central barometer location.

(9) Pressure of the mixture of exhaust and dilution air entering the CVS metering device (or pressure drop across the CFV), the pressure increase across the device, and the temperature at the inlet (if applicable). The temperature may be recorded continuously or digitally to determine temperature variations (if applicable).

(10) The number of revolutions of the positive displacement pump accumulated while exhaust samples are being collected (if applicable). The number of standard cubic feet metered by a critical flow venturi would be the equivalent record for a CFV (if applicable).

(11) The humidity of the dilution air.

NOTE: If conditioning columns are not used (see §§ 86.122 and 86.144) this measurement can be deleted. If the conditioning columns are used and the dilution air is taken from the test cell, the ambient humidity can be used for this measurement.

(12) Curb idle engine speed during the test.

(13) Idle exhaust CO concentration (dry basis).

(14) Idle exhaust raw CO_2 concentration (if applicable).

(15) Dilute bag sample CO and CO_2 concentrations (if applicable).

(16) Total CVS flow rate with calculated dilution factor for the idle mode (if applicable).

(Approved by the Office of Management and Budget under control number 2000-0390)

[48 FR 52252, Nov. 16, 1983, as amended at 49 FR 48149, Dec. 10, 1984]

§ 86.1544-84 Calculation; idle exhaust emissions.

(a) The final idle emission test results shall be reported as percent for carbon monoxide on a dry basis.

(b) If a CVS sampling system is used, the following procedure shall apply:

(1) Use the procedures, as applicable, in § 86.1342-84 to determine the dilute wet-basis CO and CO_2 in percent.

(2) Use the procedure, as applicable, in § 86.345-79 to determine the raw dry-basis CO_2 in percent.

(3) Convert the raw dry-basis CO_2 to raw wet-basis. An assumption that the percent of water by volume in the raw sample is equal to the percent of raw dry-basis CO_2 minus 0.5 percent is acceptable. For example:

10.0% dry $CO_2 - 0.5\% = 9.5\%$ water

$(1.00-0.095)$ (10.0% dry CO_2) = 9.05% wet CO_2

(4) Calculate the CVS dilution factor (DF) by:

$$DF = \frac{\text{Raw wet } CO_2\text{—background } CO_2}{\text{Dilute wet } CO_2\text{—background } CO_2}$$

(5) Convert the dilute wet-basis CO to dilute dry-basis values. An assumption that the percent of water by volume in the sample bag is 2 percent is acceptable. For example:

Dilute dry CO = (dilute wet CO)/(1.00-0.02)

(6) Calculate the raw dry-basis CO values by:

Raw dry CO = (DF) (dilute dry CO)

(c) If the raw exhaust sampling and analysis system specified in § 86.309-79 is used, the percent for carbon monoxide on a dry basis shall be calculated using the procedure, as applicable, in § 86.345-79.

(Approved by the Office of Management and Budget under control number 2000-0390)

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[48 FR 52252, Nov. 16, 1983, as amended at 49 FR 48149, Dec. 10, 1984; 50 FR 10708, Mar. 15, 1985; 51 FR 24613, July 7, 1986]

Subpart Q—Regulations for Altitude Performance Adjustments for New and In-Use Motor Vehicles and Engines

AUTHORITY: Secs. 215 and 301, Clean Air Act, as amended (42 U.S.C. 7550 and 7601).

SOURCE: 45 FR 66956, Oct. 8, 1980, unless otherwise noted.

§ 86.1601 General applicability.

This subpart applies to manufacturers of motor vehicles and motor vehicle engines (hereafter referred to as vehicles) which are subject to the requirements of Title II of the Clean Air Act. This subpart applies to the following vehicles:

(a) 1968 and later model year light-duty vehicles and light-duty trucks.

(b) 1970 and later model year heavy-duty engines built after December 31, 1969.

(c) 1978 and later model year motorcycles built after December 31, 1977.

§ 86.1602 Definitions.

The definitions provided in Subpart A also apply in this subpart. Additional definitions that apply in this subpart are as follow:

"Altitude performance adjustments" are adjustments or modifications made to vehicle, engine, or emission control functions in order to improve emission control performance at altitudes other than those for which the vehicles were designed.

"Low altitude" means any elevation less than or equal to 1,219 meters (4,000 feet).

"Manufacturer parts" are parts produced or sold by the manufacturer of the motor vehicle or motor vehicle engine.

§ 86.1603 General requirements.

(a) Manufacturers of vehicles specified in § 86.1601 shall submit to the Administrator for approval the following altitude performance adjustment instructions.

(1) Low-altitude adjustment instructions for vehicles certified to meet the appropriate high-altitude emission standards.

(2) High-altitude adjustment instructions for vehicles certified to meet the appropriate low-altitude emission standards.

(b) Manufacturers are not required to submit altitude adjustment instructions for vehicles equipped with systems or devices that compensate (in full or in part) the engine fuel metering system for air density changes. Manufacturers claiming this exemption must submit to the Administrator for approval a notification of the claim specifying the affected vehicles. The notification must also describe the compensating system used.

(c) Manufacturers may request the Administrator to waive the application of this regulation for vehicles which potentially may never be operated at an altitude other than that for which they were designed (such as vehicles which are not offered for sale within the continental United States).

(d) Manufacturers shall meet the requirements of paragraph (a), according to the following schedule:

(1) Altitude adjustment instructions for all 1980 and earlier model year vehicles or engines shall be submitted to the Administrator within one (1) year of the effective date of this regulation.

(2) Altitude adjustment instructions for 1982 and later model year vehicles or engines shall be submitted to the Administrator within 30 days of the issuance of the certificate of conformity for those vehicles or engines. For vehicles or engines certified for the 1981 model year before the publication of this regulation, altitude adjustment instructions shall be submitted within 90 days of the publication of this regulation.

(e) Failure to submit altitude performance adjustment instructions in accordance with this section is a violation of section 203(a)(3) of the Clean Air Act and may result in penalties as specified in section 205 of the Clean Air Act. The Administrator may grant extensions of the schedule in paragraph (c) if the manufacturer submits a written request to the Administrator specifying the reasons for the need for the extension. Requests for an extension must be received by EPA at least 5 working days prior to the submittal date contained in paragraph (d).

(f) The adjustment instructions (including labels) that the Administrator approves under this subpart shall be made available by the manufacturer at no cost to service outlets and the general public. EPA encourages manufacturers to notify vehicle owners in high-altitude areas of the availability of high-altitude adjustments.

(g) If altitude adjustments are performed according to the instructions approved by the Administrator, they will not be treated as violations of the tampering provisions of section 203(a) of the Act except as described below:

§ 86.1604 Conditions for disapproval.

(a) The Administrator shall not approve altitude performance adjustments that will:

(1) Cause any regulated pollutant emission level to increase if the emission level exceeded the appropriate emission standard before adjustment was made.

(2) Cause any regulated pollutant emission level to exceed the appropriate emission standard if the emission level did not exceed the emission standard before the adjustment was made.

(3) For light-duty vehicles, light-duty trucks, motorcycles, heavy-duty gasoline-fueled engines, cause any reduction of vehicle performance (as evaluated by the manufacturer) such that vehicle drivers will likely complain.

(4) Be of such technical complexity or require such complex, expensive, or exclusive equipment that a competent mechanic in an average service establishment cannot perform the adjustments correctly. Adjustment procedures should not require knowledge or training beyond that required to perform normal engine maintenance. All required equipment must be available to any service establishment at competitive cost.

(5) Require the use of manufacturer parts, unless they are necessary to ensure emission control performance and unless the Administrator grants a waiver under section 207(c)(3)(B) of the Act.

(6) Removes or defeats the parameter adjustment controls for the parameters listed in §§ 86.081-22(e)(1)(i) and 86.082-22(e)(1)(i) for light-duty vehicles and light-duty trucks, and § 86.428-80(d) for motorcycles unless:

(i) The manufacturer determines that it is reasonable to restore the parameter adjustment control in use and provides appropriate instruction as part of the high-altitude performance adjustment instructions, or

(ii) The manufacturer determines that is is not reasonable to restore the parameter adjustment control in use and alternatively includes on the label required in § 86.1606 a statement to the effect that the labeled vehicle can be adjusted but that adjustment to other than manufacturer specification may be considered violation of Federal law.

(b) If the Administrator determines that the altitude performance adjustment instructions cannot be approved, the Administrator shall notify the manufacturer in writing of the disapproval. This notification shall explain the reasons for the disapproval.

(1) Within 20 working days of the date of a notification of disapproval, the manufacturer may file a written appeal to the Administrator. The Administrator may allow additional oral or written testimony prior to rendering a final decision.

(2) If the manufacturer files no appeal with the Administrator, the disapproval becomes final.

(3) Within 30 days following the Administrator's final decision of disapproval, the manufacturer must submit new altitude performance adjustment instructions applying to all of the vehicles for which the disapproved instructions applied. If these new instructions are not submitted within 30

days, EPA may take action under sections 203(a)(3) and 205 of the Act. If the new altitude performance adjustment instructions are disapproved by the Administrator, the manufacturer may follow the appeal procedures under paragraphs (b)(1) and (b)(2) of this section.

(c) If the Administrator makes a final decision to disapprove the new instructions, EPA may take action under sections 203(a)(3) and 205 of the Act.

§ 86.1605 Information to be submitted.

(a) Manufacturers shall submit to the Administrator the text of the altitude performance adjustment instructions to be provided to vehicle owners and service establishments. Each set of altitude performance adjustment instructions must set forth the adjustment procedure (including the installation of the label required by § 86.1606) to be followed and identify the vehicles for which the instructions are applicable. At a minimum, each set of instructions shall identify the vehicle applicability by manufacturer, car line, model year, engine displacement, engine family, and exhaust emission control systems. Manufacturers may specify vehicle applicability in greater detail if necessary, but such specifications must be identifiable to the public and the service industry through vehicle marking or codes.

(b) The manufacturer shall submit to the Administrator the following information about the adjustments:

(1) Specifications of changes in calibrations of any component, including the original and new calibration values or curves;

(2) Descriptions of component additions, including a full description of the new components along with the configurations (sketch or drawing), calibration values, and part numbers;

(3) Descriptions of component replacements, including all items in paragraph (b)(2) of this section, for the new parts. Also, a description of the differences between the original component and the new component with respect to design, calibration, and function;

(4) Descriptions of any special tools necessary to perform the adjustments.

(c) The manufacturer shall submit to the Administrator the following evaluations of the adjustments:

(1) A statement that the conditions of § 86.1604 (a) (1) and (2) are not caused by the adjustment, and supporting information for this statement consisting of technical evaluations (consistent with good engineering practice) or emission test data.

(2) A statement that vehicle performance is generally unchanged or improved as result of the adjustments, and supporting information for this statement consisting of technical evaluations or driver evaluations.

(3) Information that shows compliance with section 202(a)(4)(A) of the Act (which prohibits vehicles from causing unreasonable risks to public health, welfare, and safety).

(d) The manufacturer shall submit to the Administrator for approval a copy or sample of the label required by § 86.1606 and a copy of the instructions for installation of the label.

§ 86.1606 Labeling.

(a) The manufacturer shall make available to the public as part of the altitude performance adjustment instructions the labels described in this section. Instructions for installing the labels according to the requirements of this section shall be provided with each label.

(b) The label installation instructions shall indicate the following information.

(1) For light-duty vehicles, light-duty trucks, and heavy-duty engines, the label should be affixed in a readily visible position in the engine compartment and beside (to the extent possible) the existing label which is required under § 86.079-35.

(2) For motorcycles, the label should be affixed in a readily accessible position and beside (to the extent possible) the existing label which is required under § 86.413-78(a)(1).

(3) The instructions shall also indicate that the label should not be affixed to any equipment that can be easily detached from the vehicle.

(c) The label must be constructed such that if installed properly, it cannot be removed without destroying or defacing the label.

(d) The label shall contain the following information lettered in the English language in block letters and numerals, which must be of a color that contrasts with the background of the label:

(1) The label heading: Vehicle Emission Control Information Update;

(2) Full corporate name and trademark of the vehicle manufactuer;

(3) The statement: "This vehicle has been (adjusted) (modified) to improve emission control performance when operated at (high) (low) altitude";

(4) Information on where altitude performance adjustment instructions may be obtained or include the actual altitude performance adjustment instructions;

(5) The new tuneup specifications (if changed from the original label specifications) at the applicable altitude.

Subpart AA—Reporting and Recordkeeping Requirements for Part 86

§86.2500 Reporting and recordkeeping requirements.

All reporting and recordkeeping requirements contained in Part 86, except for those requirements contained in Subparts G and K, have been approved by the Office of Management and Budget under control number 2060-0104.

(Secs. 202, 203, 206, 207, 208, 301a, Clean Air Act, as amended; 42 U.S.C. 7521, 7522, 7525, 7541, 7542, 7601a)

[50 FR 10648, Mar. 15, 1985]

APPENDICES

APPENDIX I—URBAN DYNAMOMETER SCHEDULES

(a) EPA Urban Dynamometer Driving Schedule for Light-Duty Vehicles and Light-Duty Trucks.

EPA URBAN DYNAMOMETER DRIVING SCHEDULE

[Speed versus Time Sequence]

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
0	0.0	1	0.0	2	0.0
3	0.0	4	0.0	5	0.0
6	0.0	7	0.0	8	0.0
9	0.0	10	0.0	11	0.0
12	0.0	13	0.0	14	0.0
15	0.0	16	0.0	17	0.0
18	0.0	19	0.0	20	0.0
21	3.0	22	5.9	23	8.6
24	11.5	25	14.3	26	16.9
27	17.3	28	18.1	29	20.7
30	21.7	31	22.4	32	22.5
33	22.1	34	21.5	35	20.9
36	20.4	37	19.8	38	17.0
39	14.9	40	14.9	41	15.2
42	15.5	43	16.0	44	17.1
45	19.1	46	21.1	47	22.7
48	22.9	49	22.7	50	22.6
51	21.3	52	19.0	53	17.1
54	15.8	55	15.8	56	17.7
57	19.8	58	21.6	59	23.2
60	24.2	61	24.6	62	24.9
63	25.0	64	24.6	65	24.5
66	24.7	67	24.8	68	24.7
69	24.6	70	24.6	71	25.1
72	25.6	73	25.7	74	25.4
75	24.9	76	25.0	77	25.4
78	26.0	79	26.0	80	25.7
81	26.1	82	26.7	83	27.5
84	28.6	85	29.3	86	29.8
87	30.1	88	30.4	89	30.7
90	30.7	91	30.5	92	30.4
93	30.3	94	30.4	95	30.8
96	30.4	97	29.9	98	29.5
99	29.8	100	30.3	101	30.7
102	30.9	103	31.0	104	30.9
105	30.4	106	29.8	107	29.9
108	30.2	109	30.7	110	31.2
111	31.8	112	32.2	113	32.4
114	32.2	115	31.7	116	28.6
117	25.3	118	22.0	119	18.7
120	15.4	121	12.1	122	8.8
123	5.5	124	2.2	125	0.0
126	0.0	127	0.0	128	0.0
129	0.0	130	0.0	131	0.0
132	0.0	133	0.0	134	0.0
135	0.0	136	0.0	137	0.0
138	0.0	139	0.0	140	0.0
141	0.0	142	0.0	143	0.0
144	0.0	145	0.0	146	0.0
147	0.0	148	0.0	149	0.0
150	0.0	151	0.0	152	0.0
153	0.0	154	0.0	155	0.0
156	0.0	157	0.0	158	0.0
159	0.0	160	0.0	161	0.0
162	0.0	163	0.0	164	3.3
165	6.6	166	9.9	167	13.2
168	16.5	169	19.8	170	22.2
171	24.3	172	25.8	173	26.4
174	25.7	175	25.1	176	24.7
177	25.0	178	25.2	179	25.4
180	25.8	181	27.2	182	26.5
183	24.0	184	22.7	185	19.4
186	17.7	187	17.2	188	18.1
189	18.6	190	20.0	191	22.2
192	24.5	193	27.3	194	30.5
195	33.5	196	36.2	197	37.3
198	39.3	199	40.5	200	42.1

EPA URBAN DYNAMOMETER DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
201	43.5	202	45.1	203	46.0
204	46.8	205	47.5	206	47.5
207	47.3	208	47.2	209	47.0
210	47.0	211	47.0	212	47.0
213	47.0	214	47.2	215	47.4
216	47.9	217	48.5	218	49.1
219	49.5	220	50.0	221	50.6
222	51.0	223	51.5	224	52.2
225	53.2	226	54.1	227	54.6
228	54.9	229	55.0	230	54.9
231	54.6	232	54.6	233	54.8
234	55.1	235	55.5	236	55.7
237	56.1	238	56.3	239	56.6
240	56.7	241	56.7	242	56.5
243	56.5	244	56.5	245	56.5
246	56.5	247	56.5	248	56.4
249	56.1	250	55.8	251	55.1
252	54.6	253	54.2	254	54.0
255	53.7	256	53.6	257	53.9
258	54.0	259	54.1	260	54.1
261	53.8	262	53.4	263	53.0
264	52.6	265	52.1	266	52.4
267	52.0	268	51.9	269	51.7
270	51.5	271	51.6	272	51.8
273	52.1	274	52.5	275	53.0
276	53.5	277	54.0	278	54.9
279	55.4	280	55.6	281	56.0
282	56.0	283	55.8	284	55.2
285	54.5	286	53.6	287	52.5
288	51.5	289	51.5	290	51.5
291	51.1	292	50.1	293	50.0
294	50.1	295	50.0	296	49.6
297	49.5	298	49.5	299	49.5
300	49.1	301	48.6	302	48.1
303	47.2	304	46.1	305	45.0
306	43.8	307	42.6	308	41.5
309	40.3	310	38.5	311	37.0
312	35.2	313	33.8	314	32.5
315	31.5	316	30.6	317	30.5
318	30.0	319	29.0	320	27.5
321	24.8	322	21.5	323	20.1
324	19.1	325	18.5	326	17.0
327	15.5	328	12.5	329	10.8
330	8.0	331	4.7	332	1.4
333	0.0	334	0.0	335	0.0
336	0.0	337	0.0	338	0.0
339	0.0	340	0.0	341	0.0
342	0.0	343	0.0	344	0.0
345	0.0	346	0.0	347	1.0
348	4.3	349	7.6	350	10.9
351	14.2	352	17.3	353	20.0
354	22.5	355	23.7	356	25.2
357	26.6	358	28.1	359	30.0
360	30.8	361	31.6	362	32.1
363	32.8	364	33.6	365	34.5
366	34.6	367	34.9	368	34.8
369	34.5	370	34.7	371	35.5
372	36.0	373	36.0	374	36.0
375	36.0	376	36.0	377	36.0
378	36.1	379	36.4	380	36.5
381	36.4	382	36.0	383	35.1
384	34.1	385	33.5	386	31.4
387	29.0	388	25.7	389	23.0
390	20.3	391	17.5	392	14.5
393	12.0	394	8.7	395	5.4
396	2.1	397	0.0	398	0.0
399	0.0	400	0.0	401	0.0

EPA URBAN DYNAMOMETER DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
402	0.0	403	2.6	404	5.9
405	9.2	406	12.5	407	15.8
408	19.1	409	22.4	410	25.0
411	25.6	412	27.5	413	29.0
414	30.0	415	30.1	416	30.0
417	29.7	418	29.3	419	28.8
420	28.0	421	25.0	422	21.7
423	18.4	424	15.1	425	11.8
426	8.5	427	5.2	428	1.9
429	0.0	430	0.0	431	0.0
432	0.0	433	0.0	434	0.0
435	0.0	436	0.0	437	0.0
438	0.0	439	0.0	440	0.0
441	0.0	442	0.0	443	0.0
444	0.0	445	0.0	446	0.0
447	0.0	448	3.3	449	6.6
450	9.9	451	13.2	452	16.5
453	19.8	454	23.1	455	26.4
456	27.8	457	29.1	458	31.5
459	33.0	460	33.6	461	34.8
462	35.1	463	35.6	464	36.1
465	36.0	466	36.1	467	36.2
468	36.0	469	35.7	470	36.0
471	36.0	472	35.6	473	35.5
474	35.4	475	35.2	476	35.2
477	35.2	478	35.2	479	35.2
480	35.2	481	35.0	482	35.1
483	35.2	484	35.5	485	35.2
486	35.0	487	35.0	488	35.0
489	34.8	490	34.6	491	34.5
492	33.5	493	32.0	494	30.1
495	28.0	496	25.5	497	22.5
498	19.8	499	16.5	500	13.2
501	10.3	502	7.2	503	4.0
504	1.0	505	0.0	506	0.0
507	0.0	508	0.0	509	0.0
510	0.0	511	1.2	512	3.5
513	5.5	514	6.5	515	8.5
516	9.6	517	10.5	518	11.9
519	14.0	520	16.0	521	17.7
522	19.0	523	20.1	524	21.0
525	22.0	526	23.0	527	23.8
528	24.5	529	24.9	530	25.0
531	25.0	532	25.0	533	25.0
534	25.0	535	25.0	536	25.6
537	25.8	538	26.0	539	25.6
540	25.2	541	25.0	542	25.0
543	25.0	544	24.4	545	23.1
546	19.8	547	16.5	548	13.2
549	9.9	550	6.6	551	3.3
552	0.0	553	0.0	554	0.0
555	0.0	556	0.0	557	0.0
558	0.0	559	0.0	560	0.0
561	0.0	562	0.0	563	0.0
564	0.0	565	0.0	566	0.0
567	0.0	568	0.0	569	3.3
570	6.6	571	9.9	572	13.0
573	14.6	574	16.0	575	17.0
576	17.0	577	17.0	578	17.5
579	17.7	580	17.7	581	17.5
582	17.0	583	16.9	584	16.6
585	17.0	586	17.1	587	17.0
588	16.6	589	16.5	590	16.5
591	16.6	592	17.0	593	17.6
594	18.5	595	19.2	596	20.2
597	21.0	598	21.1	599	21.2
600	21.6	601	22.0	602	22.4

EPA URBAN DYNAMOMETER DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
603	22.5	604	22.5	605	22.5
606	22.7	607	23.7	608	25.1
609	26.0	610	26.5	611	27.0
612	26.1	613	22.8	614	19.5
615	16.2	616	12.9	617	9.6
618	6.3	619	3.0	620	0.0
621	0.0	622	0.0	623	0.0
624	0.0	625	0.0	626	0.0
627	0.0	628	0.0	629	0.0
630	0.0	631	0.0	632	0.0
633	0.0	634	0.0	635	0.0
636	0.0	637	0.0	638	0.0
639	0.0	640	0.0	641	0.0
642	0.0	643	0.0	644	0.0
645	0.0	646	2.0	647	4.5
648	7.8	649	10.2	650	12.5
651	14.0	652	15.3	653	17.5
654	19.6	655	21.0	656	22.2
657	23.3	658	24.5	659	25.3
660	25.6	661	26.0	662	26.1
663	26.2	664	26.2	665	26.4
666	26.5	667	26.5	668	26.0
669	25.5	670	23.6	671	21.4
672	18.5	673	16.4	674	14.5
675	11.6	676	8.7	677	5.8
678	3.5	679	2.0	680	0.0
681	0.0	682	0.0	683	0.0
684	0.0	685	0.0	686	0.0
687	0.0	688	0.0	689	0.0
690	0.0	691	0.0	692	0.0
693	0.0	694	1.4	695	3.3
696	4.4	697	6.5	698	9.2
699	11.3	700	13.5	701	14.6
702	16.4	703	16.7	704	16.5
705	16.5	706	18.2	707	19.2
708	20.1	709	21.5	710	22.5
711	22.5	712	22.1	713	22.7
714	23.3	715	23.5	716	22.5
717	21.6	718	20.5	719	18.0
720	15.0	721	12.0	722	9.0
723	6.2	724	4.5	725	3.0
726	2.1	727	0.5	728	0.5
729	3.2	730	6.5	731	9.6
732	12.5	733	14.0	734	16.0
735	18.0	736	19.6	737	21.5
738	23.1	739	24.5	740	25.5
741	26.5	742	27.1	743	27.6
744	27.9	745	28.3	746	28.6
747	28.6	748	28.3	749	28.2
750	28.0	751	27.5	752	26.8
753	25.5	754	23.5	755	21.5
756	19.0	757	16.5	758	14.9
759	12.5	760	9.4	761	6.2
762	3.0	763	1.5	764	1.5
765	0.5	766	0.0	767	3.0
768	6.3	769	9.6	770	12.9
771	15.8	772	17.5	773	18.4
774	19.5	775	20.7	776	22.0
777	23.2	778	25.0	779	26.5
780	27.5	781	28.0	782	28.3
783	28.9	784	28.9	785	28.9
786	28.8	787	28.5	788	28.3
789	28.3	790	28.3	791	28.2
792	27.6	793	27.5	794	27.5
795	27.5	796	27.5	797	27.5
798	27.5	799	27.6	800	28.0
801	28.5	802	30.0	803	31.0

EPA URBAN DYNAMOMETER DRIVING SCHEDULE—Continued

[Speed versus Time Sequence]

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
804	32.0	805	33.0	806	33.0
807	33.6	808	34.0	809	34.3
810	34.2	811	34.0	812	34.0
813	33.9	814	33.6	815	33.1
816	33.0	817	32.5	818	32.0
819	31.9	820	31.6	821	31.5
822	30.6	823	30.0	824	29.9
825	29.9	826	29.9	827	29.9
828	29.6	829	29.5	830	29.5
831	29.3	832	28.9	833	28.2
834	27.7	835	27.0	836	25.5
837	23.7	838	22.0	839	20.5
840	19.2	841	19.2	842	20.1
843	20.9	844	21.4	845	22.0
846	22.6	847	23.2	848	24.0
849	25.0	850	26.0	851	26.6
852	26.6	853	26.8	854	27.0
855	27.2	856	27.8	857	28.1
858	28.8	859	28.9	860	29.0
861	29.1	862	29.0	863	28.1
864	27.5	865	27.0	866	25.8
867	25.0	868	24.5	869	24.8
870	25.1	871	25.5	872	25.7
873	26.2	874	26.9	875	27.5
876	27.8	877	28.4	878	29.0
879	29.2	880	29.1	881	29.0
882	28.9	883	28.5	884	28.1
885	28.0	886	28.0	887	27.6
888	27.2	889	26.6	890	27.0
891	27.5	892	27.8	893	28.0
894	27.8	895	28.0	896	28.0
897	28.0	898	27.7	899	27.4
900	26.9	901	26.6	902	26.5
903	26.5	904	26.5	905	26.3
906	26.2	907	26.2	908	25.9
909	25.6	910	25.6	911	25.9
912	25.8	913	25.5	914	24.6
915	23.5	916	22.2	917	21.6
918	21.6	919	21.7	920	22.6
921	23.4	922	24.0	923	24.2
924	24.4	925	24.9	926	25.1
927	25.2	928	25.3	929	25.5
930	25.2	931	25.0	932	25.0
933	25.0	934	24.7	935	24.5
936	24.3	937	24.3	938	24.5
939	25.0	940	25.0	941	24.6
942	24.6	943	24.1	944	24.5
945	25.1	946	25.6	947	25.1
948	24.0	949	22.0	950	20.1
951	16.9	952	13.6	953	10.3
954	7.0	955	3.7	956	0.4
957	0.0	958	0.0	959	0.0
960	2.0	961	5.0	962	8.6
963	11.9	964	15.2	965	17.5
966	18.6	967	20.0	968	21.1
969	22.0	970	23.0	971	24.5
972	26.3	973	27.5	974	28.1
975	28.4	976	28.5	977	28.5
978	28.5	979	27.7	980	27.5
981	27.2	982	26.8	983	26.5
984	26.0	985	25.7	986	25.2
987	24.0	988	22.0	989	21.5
990	21.5	991	21.8	992	22.5
993	23.0	994	22.8	995	22.8
996	23.0	997	22.7	998	22.7
999	22.7	1000	23.5	1001	24.0
1002	24.6	1003	24.8	1004	25.1

EPA Urban Dynamometer Driving Schedule—Continued

[Speed versus Time Sequence]

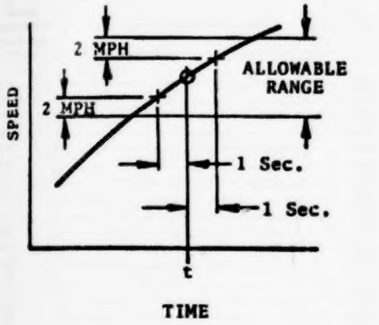
Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
1005	25.5	1006	25.6	1007	25.5
1008	25.0	1009	24.1	1010	23.7
1011	23.2	1012	22.9	1013	22.5
1014	22.0	1015	21.6	1016	20.5
1017	17.5	1018	14.2	1019	10.9
1020	7.6	1021	4.3	1022	1.0
1023	0.0	1024	0.0	1025	0.0
1026	0.0	1027	0.0	1028	0.0
1029	0.0	1030	0.0	1031	0.0
1032	0.0	1033	0.0	1034	0.0
1035	0.0	1036	0.0	1037	0.0
1038	0.0	1039	0.0	1040	0.0
1041	0.0	1042	0.0	1043	0.0
1044	0.0	1045	0.0	1046	0.0
1047	0.0	1048	0.0	1049	0.0
1050	0.0	1051	0.0	1052	0.0
1053	1.2	1054	4.0	1055	7.3
1056	10.6	1057	13.9	1058	17.0
1059	18.5	1060	20.0	1061	21.8
1062	23.0	1063	24.0	1064	24.8
1065	25.6	1066	26.5	1067	26.8
1068	27.4	1069	27.9	1070	28.3
1071	28.0	1072	27.5	1073	27.0
1074	27.0	1075	26.3	1076	24.5
1077	22.5	1078	21.5	1079	20.6
1080	18.0	1081	15.0	1082	12.3
1083	11.1	1084	10.6	1085	10.0
1086	9.5	1087	9.1	1088	8.7
1089	8.6	1090	8.8	1091	9.0
1092	8.7	1093	8.6	1094	8.0
1095	7.0	1096	5.0	1097	4.2
1098	2.6	1099	1.0	1100	0.0
1101	0.1	1102	0.6	1103	1.6
1104	3.6	1105	6.9	1106	10.0
1107	12.8	1108	14.0	1109	14.5
1110	16.0	1111	18.1	1112	20.0
1113	21.0	1114	21.2	1115	21.3
1116	21.4	1117	21.7	1118	22.5
1119	23.0	1120	23.8	1121	24.5
1122	25.0	1123	24.9	1124	24.8
1125	25.0	1126	25.4	1127	25.8
1128	26.0	1129	26.4	1130	26.6
1131	26.9	1132	27.0	1133	27.0
1134	27.0	1135	26.9	1136	26.8
1137	26.8	1138	26.5	1139	26.4
1140	26.0	1141	25.5	1142	24.6
1143	23.5	1144	21.5	1145	20.0
1146	17.5	1147	16.0	1148	14.0
1149	10.7	1150	7.4	1151	4.1
1152	0.8	1153	0.0	1154	0.0
1155	0.0	1156	0.0	1157	0.0
1158	0.0	1159	0.0	1160	0.0
1161	0.0	1162	0.0	1163	0.0
1164	0.0	1165	0.0	1166	0.0
1167	0.0	1168	0.0	1169	2.1
1170	5.4	1171	8.7	1172	12.0
1173	15.3	1174	18.6	1175	21.1
1176	23.0	1177	23.5	1178	23.0
1179	22.5	1180	20.0	1181	16.7
1182	13.4	1183	10.1	1184	6.8
1185	3.5	1186	0.2	1187	0.0
1188	0.0	1189	0.0	1190	0.0
1191	0.0	1192	0.0	1193	0.0
1194	0.0	1195	0.0	1196	0.0
1197	0.2	1198	1.5	1199	3.5
1200	6.5	1201	9.8	1202	12.0
1203	12.9	1204	13.0	1205	12.6

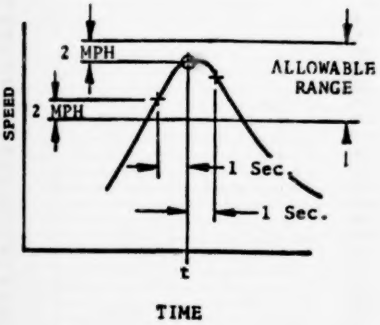
EPA Urban Dynamometer Driving Schedule—Continued

[Speed versus Time Sequence]

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
1206	12.8	1207	13.1	1208	13.1
1209	14.0	1210	15.5	1211	17.0
1212	18.6	1213	19.7	1214	21.0
1215	21.5	1216	21.8	1217	21.8
1318	21.5	1219	21.2	1220	21.5
1221	21.8	1222	22.0	1223	21.9
1224	21.7	1225	21.5	1226	21.5
1227	21.4	1228	20.1	1229	19.5
1230	19.2	1231	19.6	1232	19.8
1233	20.0	1234	19.5	1235	17.5
1236	15.5	1237	13.0	1238	10.0
1239	8.0	1240	6.0	1241	4.0
1242	2.5	1243	0.7	1244	0.0
1245	0.0	1246	0.0	1247	0.0
1248	0.0	1249	0.0	1250	0.0
1251	0.0	1252	1.0	1253	1.0
1254	1.0	1255	1.0	1256	1.0
1257	1.6	1258	3.0	1259	4.0
1260	5.0	1261	6.3	1262	8.0
1263	10.0	1264	10.5	1265	9.5
1266	8.5	1267	7.6	1268	8.8
1269	11.0	1270	14.0	1271	17.0
1272	19.5	1273	21.0	1274	21.8
1275	22.2	1276	23.0	1277	23.6
1278	24.1	1279	24.5	1280	24.5
1281	24.0	1282	23.5	1283	23.5
1284	23.5	1285	23.5	1286	23.5
1287	23.5	1288	24.0	1289	24.1
1290	24.5	1291	24.7	1292	25.0
1293	25.4	1294	25.6	1295	25.7
1296	26.0	1297	26.2	1298	27.0
1299	27.8	1300	28.3	1301	29.0
1302	29.1	1303	29.0	1304	28.0
1305	24.7	1306	21.4	1307	18.1
1308	14.8	1309	11.5	1310	8.2
1311	4.9	1312	1.6	1313	0.0
1314	0.0	1315	0.0	1316	0.0
1317	0.0	1318	0.0	1319	0.0
1320	0.0	1321	0.0	1322	0.0
1323	0.0	1324	0.0	1325	0.0
1326	0.0	1327	0.0	1328	0.0
1329	0.0	1330	0.0	1331	0.0
1332	0.0	1333	0.0	1334	0.0
1335	0.0	1336	0.0	1337	0.0
1338	1.5	1339	4.8	1340	8.1
1341	11.4	1342	13.2	1343	15.1
1344	16.8	1345	18.8	1346	19.5
1347	20.3	1348	21.3	1349	21.9
1350	22.1	1351	22.4	1352	22.0
1353	21.6	1354	21.1	1355	20.5
1356	20.0	1357	19.6	1358	18.5
1359	17.5	1360	16.5	1361	15.5
1362	14.0	1363	11.0	1364	8.0
1365	5.2	1366	2.5	1367	0.0
1368	0.0	1369	0.0	1370	0.0
1371	0.0	1372	0.0		

The diagrams below show the range of acceptable speed tolerances for typical points. The curve on the left is typical of portions of the speed curve which are increasing or decreasing throughout the 2 second time interval. The curve on the right is typical of portions of the speed curve which include a maximum or minimum value.





(b) EPA Urban Dynamometer Driving Schedule for Light-Duty Vehicles, Light-Duty Trucks, and Motorcycles with engine displacements equal to or greater than 170 cc (10.4 cu. in.).

SPEED VERSUS TIME SEQUENCE

Time (seconds)	Speed (kilometers per hour)
0	0
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	0
15	0
16	0

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
17	0
18	0
19	0
20	0
21	4.8
22	9.5
23	13.8
24	18.5
25	23.0
26	27.2
27	27.8
28	29.1
29	33.3
30	34.9
31	36.0
32	36.2
33	35.6
34	34.6
35	33.6
36	32.8
37	31.9
38	27.4
39	24.0
40	24.0
41	24.5
42	24.9
43	25.7
44	27.5
45	30.7
46	34.0
47	36.5
48	36.9
49	36.5
50	36.4
51	34.3
52	30.6
53	27.5
54	25.4
55	25.4
56	28.5
57	31.9
58	34.8
59	37.3
60	38.9
61	39.6
62	40.1
63	40.2
64	39.6
65	39.4
66	39.8
67	39.9
68	39.8
69	39.6
70	39.6
71	40.4
72	41.2
73	41.4
74	40.9
75	40.1
76	40.2
77	40.9
78	41.8
79	41.8
80	41.4
81	42.0
82	43.0
83	44.3
84	46.0
85	47.2

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
86	48.0
87	48.4
88	48.9
89	49.4
90	49.4
91	49.1
92	48.9
93	48.8
94	48.9
95	49.6
96	48.9
97	48.1
98	47.5
99	48.0
100	48.8
101	49.4
102	49.7
103	49.9
104	49.7
105	48.9
106	48.0
107	48.1
108	48.6
109	49.4
110	50.2
111	51.2
112	51.8
113	52.1
114	51.8
115	51.0
116	46.0
117	40.7
118	35.4
119	30.1
120	24.8
121	19.5
122	14.2
123	8.9
124	3.5
125	0
126	0
127	0
128	0
129	0
130	0
131	0
132	0
133	0
134	0
135	0
136	0
137	0
138	0
139	0
140	0
141	0
142	0
143	0
144	0
145	0
146	0
147	0
148	0
149	0
150	0
151	0
152	0
153	0
154	0

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
155	0
156	0
157	0
158	0
159	0
160	0
161	0
162	0
163	0
164	5.3
165	10.6
166	15.9
167	21.2
168	26.6
169	31.9
170	35.7
171	39.1
172	41.5
173	42.5
174	41.4
175	40.4
176	39.8
177	40.2
178	40.6
179	40.9
180	41.5
181	43.6
182	42.6
183	38.6
184	36.5
185	31.2
186	28.5
187	27.7
188	28.1
189	29.9
190	32.2
191	35.7
192	39.4
193	43.5
194	48.1
195	53.5
196	58.3
197	60.3
198	62.3
199	65.2
200	67.9
201	70.0
202	72.6
203	74.0
204	75.3
205	76.4
206	76.4
207	76.1
208	76.3
209	75.6
210	75.6
211	75.6
212	75.6
213	75.8
214	76.2
215	76.3
216	77.1
217	78.1
218	79.2
219	79.7
220	80.5
221	81.4
222	82.1
223	82.9

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
224	84.0
225	85.6
226	87.1
227	87.9
228	88.4
229	88.5
230	88.4
231	87.9
232	87.9
233	88.2
234	88.7
235	89.3
236	89.6
237	90.3
238	90.6
239	91.1
240	91.2
241	91.2
242	90.9
243	90.9
244	90.9
245	90.9
246	90.9
247	90.9
248	90.8
249	90.3
250	89.8
251	88.7
252	87.9
253	87.2
254	86.9
255	86.4
256	86.3
257	86.7
258	86.9
259	87.1
260	87.1
261	86.6
262	85.9
263	85.3
264	84.7
265	83.8
266	84.3
267	83.7
268	83.5
269	83.2
270	82.9
271	83.0
272	83.4
273	83.8
274	84.5
275	85.3
276	86.1
277	86.9
278	88.4
279	89.2
280	89.5
281	90.1
282	90.1
283	89.8
284	88.8
285	87.7
286	86.3
287	84.5
288	82.9
289	82.9
290	82.9
291	82.2
292	80.6

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
293	80.5
294	80.6
295	80.5
296	79.8
297	79.7
298	79.7
299	79.7
300	79.0
301	78.2
302	77.4
303	76.0
304	74.2
305	72.4
306	70.5
307	68.6
308	66.8
309	64.9
310	62.0
311	59.5
312	56.6
313	54.4
314	52.3
315	50.7
316	49.2
317	49.1
318	48.3
319	46.7
320	44.3
321	39.9
322	34.6
323	32.3
324	30.7
325	29.8
326	27.4
327	24.9
328	20.1
329	17.4
330	12.9
331	7.6
332	2.3
333	0
334	0
335	0
336	0
337	0
338	0
339	0
340	0
341	0
342	0
343	0
344	0
345	0
346	0
347	1.6
348	6.9
349	12.2
350	17.5
351	22.9
352	27.8
353	32.2
354	36.2
355	38.1
356	40.6
357	42.8
358	45.2
359	48.3
360	49.6
361	50.9

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
362	51.7
363	52.3
364	54.1
365	55.5
366	55.7
367	56.2
368	56.0
369	55.5
370	55.8
371	57.1
372	57.9
373	57.9
374	57.9
375	57.9
377	57.9
376	57.9
378	58.1
379	58.6
380	58.7
381	58.6
382	57.9
383	56.5
384	54.9
385	53.9
386	50.5
387	46.7
388	41.4
389	37.0
390	32.7
391	28.2
392	23.3
393	19.3
394	14.0
395	8.7
396	3.4
397	0
398	0
399	0
400	0
401	0
402	0
403	4.2
404	9.5
405	14.5
406	20.1
407	25.4
408	30.7
409	36.0
410	40.2
411	41.2
412	44.3
413	46.7
414	48.3
415	48.4
416	48.3
417	47.8
418	47.2
419	46.3
420	45.1
421	40.2
422	34.9
423	29.6
424	24.3
425	19.0
426	13.7
427	8.4
428	3.1
429	0
430	0

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
431	0
432	0
433	0
434	0
435	0
436	0
437	0
438	0
439	0
440	0
441	0
442	0
443	0
444	0
445	0
446	0
447	0
448	5.3
449	10.6
450	15.9
451	21.2
452	26.6
453	31.0
454	37.2
455	42.5
456	44.7
457	46.8
458	50.7
459	53.1
460	54.1
461	56.0
462	56.5
463	57.3
464	58.1
465	57.9
466	58.1
467	58.3
468	57.9
469	57.5
470	57.9
471	57.9
472	57.3
473	57.1
474	57.0
475	56.8
476	56.8
477	56.5
478	56.8
479	56.8
480	56.6
481	56.3
482	56.5
483	56.6
484	57.1
485	56.6
486	56.2
487	56.1
488	56.2
489	56.5
490	55.7
491	[illegible]
492	[illegible]
493	[illegible]
494	[illegible]
495	[illegible]
496	[illegible]
497	[illegible]
498	[illegible]
499	[illegible]

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
500	21.2
501	16.6
502	11.6
503	6.4
504	1.6
505	0
506	0
507	0
508	0
509	0
510	0
511	1.9
512	5.6
513	8.9
514	10.5
515	13.7
516	15.4
517	16.9
518	19.2
519	22.5
520	25.7
521	28.5
522	30.6
523	32.3
524	33.8
525	35.4
526	37.0
527	38.3
528	39.4
529	40.1
530	40.2
531	40.2
532	40.2
533	40.2
534	40.2
535	40.2
536	41.2
537	41.5
538	41.8
539	41.2
540	40.6
541	40.2
542	40.2
543	40.2
544	39.3
545	37.2
546	31.9
547	26.6
548	21.2
549	15.9
550	10.6
551	5.3
552	0
553	0
554	0
555	0
556	0
557	0
558	0
559	0
560	0
561	0
562	0
563	0
564	0
565	0
566	0
567	0
568	0

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
569	5.3
570	10.6
571	15.9
572	20.9
573	23.5
574	25.7
575	27.4
576	27.4
577	21.4
578	28.2
579	28.5
580	28.5
581	28.2
582	27.4
583	27.2
584	26.7
585	27.4
586	27.5
587	27.4
588	26.7
589	26.6
590	26.6
591	26.7
592	27.4
593	28.3
594	29.8
595	30.9
596	32.5
597	33.8
598	34.0
599	34.1
600	34.8
601	35.4
602	36.0
603	36.2
604	36.2
605	36.2
606	36.5
607	38.1
608	40.4
609	41.8
610	42.6
611	43.5
612	42.0
613	36.7
614	31.4
615	26.1
616	20.8
617	15.4
618	10.1
619	4.8
620	0
621	0
622	0
623	0
624	0
625	0
626	0
627	0
628	0
629	0
630	0
631	0
632	0
633	0
634	0
635	0
636	0
637	0

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
638	0
639	0
640	0
641	0
642	0
643	0
644	0
645	0
646	3.2
647	7.2
648	12.6
649	16.4
650	20.1
651	22.5
652	24.6
653	28.2
654	31.5
655	33.8
656	35.7
657	37.5
658	38.4
659	40.7
660	41.2
661	41.8
662	43.9
663	43.1
664	42.3
665	42.5
666	42.6
667	42.6
668	41.8
669	41.0
670	38.0
671	34.4
672	29.8
673	26.4
674	23.3
675	18.7
676	14.0
677	9.3
678	5.6
679	3.2
680	0
681	0
682	0
683	0
684	0
685	0
686	0
687	0
688	0
689	0
690	0
691	0
692	0
693	0
694	2.3
695	5.3
696	7.1
697	10.5
698	14.8
699	18.2
700	21.7
701	23.5
702	26.4
703	26.9
704	26.6
705	26.6
706	29.3

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
707	30.9
708	32.3
709	34.6
710	36.2
711	36.2
712	35.6
713	36.5
714	37.5
715	37.8
716	36.2
717	34.8
718	33.0
719	29.0
720	24.1
721	19.3
722	14.5
723	10.0
724	7.2
725	4.8
726	3.4
727	0.8
728	0.8
729	5.1
730	10.5
731	15.4
732	20.1
733	22.5
734	25.7
735	29.0
736	31.5
737	34.6
738	37.2
739	39.4
740	41.0
741	42.6
742	43.6
743	44.4
744	44.9
745	45.5
746	46.0
747	46.0
748	45.5
749	45.4
750	45.1
751	44.3
752	43.1
753	41.0
754	37.8
755	34.6
756	30.6
757	28.6
758	24.0
759	20.1
760	15.1
761	10.0
762	4.8
763	2.4
764	2.4
765	0.8
766	0
767	4.8
768	10.1
769	15.4
770	20.8
771	25.4
772	28.2
773	29.6
774	31.4
775	33.3

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
776	35.4
777	37.3
778	40.2
779	42.6
780	44.3
781	45.1
782	45.5
783	46.5
784	46.5
785	46.5
786	46.3
787	45.9
788	45.5
789	45.5
790	45.5
791	45.4
792	44.4
793	44.3
794	44.3
795	44.3
796	44.3
797	44.3
798	44.3
799	44.4
800	45.1
801	45.9
802	48.3
803	49.9
804	51.5
805	53.1
806	53.1
807	54.1
808	54.7
809	55.2
810	55.0
811	54.7
812	54.7
813	54.6
814	54.1
815	53.3
816	53.1
817	52.3
818	51.5
819	51.3
820	50.9
821	50.7
822	49.2
823	48.3
824	48.1
825	48.1
826	48.1
827	48.1
828	47.6
829	47.5
830	47.5
831	47.2
832	46.5
833	45.4
834	44.6
835	43.5
836	41.0
837	38.1
838	35.4
839	33.0
840	30.9
841	30.9
842	32.3
843	33.6
844	34.4

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
845	35.4
846	36.4
847	37.3
848	38.6
849	40.2
850	41.8
851	42.8
852	42.8
853	43.1
854	43.5
855	43.8
856	44.7
857	45.2
858	46.3
853	46.5
860	46.7
861	46.8
862	46.7
863	45.2
864	44.3
865	43.5
866	41.5
867	40.2
868	39.4
869	39.9
870	40.4
871	41.0
872	41.4
873	42.2
874	43.3
875	44.3
876	44.7
877	45.7
878	46.7
879	47.0
880	46.8
881	46.7
882	46.5
883	45.9
884	45.2
885	45.1
886	45.1
887	44.4
888	43.8
889	42.8
890	43.5
891	44.3
892	44.7
893	45.1
894	44.7
895	45.1
896	45.1
897	45.1
898	44.6
899	44.1
900	43.3
901	42.8
902	42.6
903	42.6
904	42.6
905	42.3
906	42.2
907	42.2
908	41.7
909	41.2
910	41.2
911	41.7
912	41.5
913	41.0

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
914	39.6
915	37.8
916	35.7
917	34.8
918	34.8
919	34.9
920	36.4
921	37.7
922	38.6
923	38.9
924	39.3
925	40.1
926	40.4
927	40.6
928	40.7
929	41.0
930	40.6
931	40.2
932	40.3
933	40.2
934	39.8
935	39.4
936	39.1
937	39.1
938	39.4
939	40.2
940	40.2
941	39.6
942	39.6
943	38.8
944	39.4
945	40.4
946	41.2
947	40.4
948	38.6
949	35.4
950	32.3
951	27.2
952	21.9
953	16.6
954	11.3
955	6.0
956	0.6
957	0
958	0
959	0
960	3.2
961	8.5
962	13.8
963	19.2
964	24.5
965	28.2
966	29.9
967	32.2
968	34.0
969	35.4
970	37.0
971	39.4
972	42.3
973	44.3
974	45.2
975	45.7
976	45.9
977	45.9
978	45.9
979	44.6
980	44.3
981	43.8
982	43.1

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
983	42.6
984	41.8
985	41.4
986	40.6
987	38.6
988	35.4
989	34.6
990	34.6
991	35.1
992	36.2
993	37.0
994	36.7
995	36.7
996	37.0
997	36.5
998	36.5
999	36.5
1,000	37.8
1,001	38.6
1,002	38.6
1,003	39.9
1,004	40.4
1,005	41.0
1,006	41.2
1,007	41.0
1,008	40.2
1,009	38.8
1,010	38.1
1,011	37.3
1,012	36.9
1,013	36.2
1,014	35.4
1,015	34.8
1,016	33.0
1,017	29.2
1,018	22.9
1,019	17.5
1,020	12.2
1,021	6.9
1,022	1.6
1,023	0
1,024	0
1,025	0
1,026	0
1,027	0
1,028	0
1,029	0
1,030	0
1,031	0
1,032	0
1,033	0
1,034	0
1,035	0
1,036	0
1,037	0
1,038	0
1,039	0
1,040	0
1,041	0
1,042	0
1,043	0
1,044	0
1,045	0
1,046	0
1,047	0
1,048	[illegible]
1,049	[illegible]
1,050	[illegible]
1,051	[illegible]

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
1,052	0
1,053	1.9
1,054	6.4
1,055	11.7
1,056	17.1
1,057	22.4
1,058	27.4
1,059	29.8
1,060	32.2
1,061	35.1
1,062	37.0
1,063	38.6
1,064	39.9
1,065	41.2
1,066	42.6
1,067	43.1
1,068	44.1
1,069	44.9
1,070	45.5
1,071	45.1
1,072	44.3
1,073	43.5
1,074	43.5
1,075	42.3
1,076	39.4
1,077	36.2
1,078	34.6
1,079	33.2
1,080	29.0
1,081	24.1
1,082	19.8
1,083	17.9
1,084	17.1
1,085	16.1
1,086	15.3
1,087	14.6
1,088	14.0
1,089	13.8
1,090	14.2
1,091	14.5
1,092	14.0
1,093	13.8
1,094	12.9
1,095	11.3
1,096	8.0
1,097	6.8
1,098	4.2
1,099	1.6
1,100	0
1,101	0.2
1,102	1.0
1,103	2.6
1,104	5.8
1,105	11.1
1,106	16.1
1,107	20.6
1,108	22.5
1,109	23.3
1,110	25.7
1,111	29.1
1,112	32.2
1,113	33.8
1,114	34.1
1,115	34.3
1,116	34.4
1,117	34.9
1,118	36.2
1,119	37.0
1,120	38.3

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
1,121	39.4
1,122	40.2
1,123	40.1
1,124	39.9
1,125	40.2
1,126	40.9
1,127	41.5
1,128	41.8
1,129	42.5
1,130	42.8
1,131	43.3
1,132	43.5
1,133	43.5
1,134	43.5
1,135	43.3
1,136	43.1
1,137	43.1
1,138	42.6
1,139	42.5
1,140	41.8
1,141	41.0
1,142	39.6
1,143	37.8
1,144	34.6
1,145	32.2
1,146	28.2
1,147	25.7
1,148	22.5
1,149	17.2
1,150	11.9
1,151	6.6
1,152	1.3
1,153	0
1,154	0
1,155	0
1,156	0
1,157	0
1,158	0
1,159	0
1,160	0
1,161	0
1,162	0
1,163	0
1,164	0
1,165	0
1,166	0
1,167	0
1,168	0
1,169	3.4
1,170	8.7
1,171	14.0
1,172	19.3
1,173	24.6
1,174	29.9
1,175	34.0
1,176	37.0
1,177	37.8
1,178	37.0
1,179	36.2
1,180	32.2
1,181	26.9
1,182	21.6
1,183	16.3
1,184	10.9
1,185	5.6
1,186	0.3
1,187	0
1,188	0
1,189	0

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
1,190	0
1,191	0
1,192	0
1,193	0
1,194	0
1,195	0
1,196	0
1,197	0.3
1,198	2.4
1,199	5.6
1,200	10.5
1,201	15.8
1,202	19.3
1,203	20.8
1,204	20.9
1,205	20.3
1,206	20.6
1,207	21.1
1,208	21.1
1,209	22.5
1,210	24.9
1,211	27.4
1,212	29.9
1,213	31.7
1,214	33.8
1,215	34.6
1,216	35.1
1,217	35.1
1,218	34.6
1,219	34.1
1,220	34.6
1,221	35.1
1,222	35.4
1,223	35.2
1,224	34.9
1,225	34.6
1,226	34.6
1,227	34.4
1,228	32.3
1,229	31.4
1,230	30.9
1,231	31.5
1,232	31.9
1,233	32.2
1,234	31.4
1,235	28.2
1,236	24.9
1,237	20.9
1,238	16.1
1,239	12.9
1,240	9.7
1,241	6.4
1,242	4.0
1,243	1.1
1,244	0
1,245	0
1,246	0
1,247	0
1,248	0
1,249	0
1,250	0
1,251	0
1,252	1.6
1,253	1.6
1,254	1.6
1,255	1.6
1,256	1.6
1,257	2.6
1,258	4.8

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
1,259	6.4
1,260	8.0
1,261	10.1
1,262	12.9
1,263	16.1
1,264	16.9
1,265	15.3
1,266	13.7
1,267	12.2
1,268	14.2
1,269	17.7
1,270	22.5
1,271	27.4
1,272	31.4
1,273	33.8
1,274	35.1
1,275	35.7
1,276	37.0
1,277	38.0
1,278	38.6
1,279	39.4
1,280	39.4
1,281	38.6
1,282	37.8
1,283	37.8
1,284	37.8
1,285	37.8
1,286	37.8
1,287	37.8
1,288	38.6
1,289	38.8
1,290	39.4
1,291	39.8
1,292	40.2
1,293	40.9
1,294	41.2
1,295	41.4
1,296	41.8
1,297	42.2
1,298	43.5
1,299	44.7
1,300	45.5
1,301	46.7
1,302	46.8
1,303	46.7
1,304	45.1
1,305	39.8
1,306	34.4
1,307	29.1
1,308	23.8
1,309	18.5
1,310	13.2
1,311	7.9
1,312	2.6
1,313	0
1,314	0
1,315	0
1,316	0
1,317	0
1,318	0
1,319	0
1,320	0
1,321	0
1,322	0
1,323	0
1,324	0
1,325	0
1,326	0
1,327	

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
1,328	0
1,329	0
1,330	0
1,331	0
1,332	0
1,333	0
1,334	0
1,335	0
1,336	0
1,337	0
1,338	2.4
1,339	7.7
1,340	13.0
1,341	18.3
1,342	21.2
1,343	24.3
1,344	27.0
1,345	29.5
1,346	31.4
1,347	32.7
1,348	34.3
1,349	35.2
1,350	35.6
1,351	36.0
1,352	35.4
1,353	34.8
1,354	34.0
1,355	33.0
1,356	32.2
1,357	31.5
1,358	29.8
1,359	28.2
1,360	26.6
1,361	24.9
1,362	22.5
1,363	17.7
1,364	12.9
1,365	8.4
1,366	4.0
1,367	0
1,368	0
1,369	0
1,370	0
1,371	0

(c) EPA Urban Dynamometer Driving Schedule for motorcycles with engine displacements less than 170 cc (10.4 cu. in.).

SPEED VERSUS TIME SEQUENCE

Time (seconds)	Speed (kilometers per hour)
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	0
15	0
16	0
17	0
18	0
19	0
20	0
21	4.8
22	9.5
23	13.8
24	18.5
25	23.0
26	27.2
27	27.8
28	29.1
29	33.3
30	34.9
31	36.0
32	36.2
33	35.6
34	34.6
35	33.6
36	32.8
37	31.9
38	27.4
39	24.0
40	24.0
41	24.5
42	24.9
43	25.7
44	27.5
45	30.7
46	34.0
47	36.5
48	36.9
49	36.5
50	36.4
51	34.3
52	30.6
53	27.5
54	25.4
55	25.4
56	28.6
57	31.9
58	34.8
59	37.3
60	38.9
61	39.6
62	40.1
63	40.2
64	39.6
65	39.4
66	39.8
67	39.9
68	39.8
69	39.6
70	39.6
71	40.4
72	41.2
73	41.4
74	40.9
75	40.1
76	40.2
77	40.9
78	41.8
79	41.8
80	41.4

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
81	42.0
82	43.0
83	44.3
84	46.0
85	47.2
86	48.0
87	48.4
88	48.9
89	49.4
90	49.4
91	49.1
92	48.9
93	48.8
94	48.9
95	49.6
96	48.9
97	48.1
98	47.5
99	48.0
100	48.8
101	49.4
102	49.7
103	49.9
104	49.7
105	48.9
106	48.0
107	48.1
108	48.6
109	49.4
110	50.2
111	51.2
112	51.8
113	52.1
114	51.8
115	51.0
116	46.0
117	40.7
118	35.4
119	30.1
120	24.8
121	19.5
122	14.2
123	8.9
124	3.5
125	0
126	0
127	0
128	0
129	0
130	0
131	0
132	0
133	0
134	0
135	0
136	0
137	0
138	0
139	0
140	0
141	0
142	0
143	0
144	0
145	0
146	0
147	0
148	0
149	0

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
150	0
151	0
152	0
153	0
154	0
155	0
156	0
157	0
158	0
159	0
160	0
161	0
162	0
163	0
164	3.4
165	6.8
166	10.3
167	13.7
168	17.1
169	20.5
170	23.8
171	25.2
172	26.7
173	27.4
174	[illegible]
175	[illegible]
176	[illegible]
177	[illegible]
178	[illegible]
179	[illegible]
180	[illegible]
181	[illegible]
182	[illegible]
183	[illegible]
184	[illegible]
185	[illegible]
186	[illegible]
187	[illegible]
188	[illegible]
189	[illegible]
190	[illegible]
191	[illegible]
192	[illegible]
193	[illegible]
194	[illegible]
195	[illegible]
196	[illegible]
197	[illegible]
198	[illegible]
199	[illegible]
200	[illegible]
201	[illegible]
202	[illegible]
203	[illegible]
204	[illegible]
205	[illegible]
206	[illegible]
207	[illegible]
208	[illegible]
209	[illegible]
210	[illegible]
211	[illegible]
212	[illegible]
213	[illegible]
214	[illegible]
215	[illegible]
216	[illegible]
217	[illegible]
218	[illegible]

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
219	51.3
220	51.8
221	52.4
222	52.8
223	53.4
224	54.1
225	55.1
226	56.0
227	56.6
228	56.9
229	57.0
230	56.9
231	56.6
232	56.6
233	56.8
234	57.1
235	57.5
236	57.7
237	58.1
238	58.3
239	58.6
240	58.7
241	58.7
242	58.5
243	58.5
244	58.5
245	58.5
246	58.5
247	58.5
248	58.4
249	58.1
250	57.8
251	57.1
252	56.6
253	56.2
254	55.9
255	55.6
256	55.5
257	55.8
258	55.9
259	56.0
260	56.0
261	55.7
262	55.3
263	54.9
264	54.5
265	54.0
266	54.3
267	53.9
268	53.8
269	53.6
270	53.4
271	53.5
272	53.7
273	54.0
274	54.4
275	54.9
276	55.4
277	55.9
278	56.9
279	57.4
280	57.6
281	58.0
282	58.0
283	57.8
284	57.2
285	56.5
286	55.5
287	54.4

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
288	53.4
289	53.4
290	53.4
291	52.9
292	51.9
293	51.8
294	51.9
295	51.8
296	51.4
297	51.3
298	51.3
299	51.3
300	50.9
301	50.3
302	49.8
303	48.9
304	47.8
305	46.6
306	45.4
307	44.1
308	43.0
309	41.8
310	39.9
311	38.3
312	36.5
313	35.0
314	33.7
315	32.6
316	31.7
317	31.6
318	31.1
319	30.0
320	28.5
321	25.7
322	22.3
323	20.8
324	19.8
325	19.2
326	17.6
327	16.1
328	12.9
329	11.2
330	8.3
331	4.9
332	1.5
333	0
334	0
335	0
336	0
337	0
338	0
339	0
340	0
341	0
342	0
343	0
344	0
345	0
346	0
347	1.6
348	6.9
349	12.2
350	17.5
351	22.9
352	27.8
353	32.2
354	36.2
355	38.1
356	40.6

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
357	42.8
358	45.2
359	48.3
360	49.6
361	50.9
362	51.7
363	52.8
364	54.1
365	55.5
366	55.7
367	56.2
368	56.0
369	55.5
370	55.8
371	57.1
372	57.9
373	57.9
374	57.9
375	57.9
376	57.9
377	57.9
378	58.1
379	58.6
380	58.7
381	58.6
382	57.9
383	56.5
384	54.9
385	53.9
386	50.5
387	46.7
388	41.4
389	37.0
390	32.7
391	26.2
392	23.3
393	19.3
394	14.0
395	8.7
396	3.4
397	0
398	0
399	0
400	0
401	0
402	0
403	4.2
404	9.5
405	14.8
406	20.1
407	25.4
408	30.7
409	36.0
410	40.2
411	41.2
412	44.3
413	46.7
414	48.3
415	48.4
416	48.3
417	47.8
418	47.2
419	46.3
420	45.1
421	40.2
422	34.9
423	29.6
424	24.3
425	19.0

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
426	[illegible]
427	8.4
428	3.1
429	0
430	0
431	0
432	0
433	0
434	0
435	0
436	0
437	0
438	0
439	0
440	0
441	0
442	0
443	0
444	0
445	0
446	0
447	[illegible]
448	[illegible]
449	[illegible]
450	[illegible]
451	[illegible]
452	[illegible]
453	[illegible]
454	[illegible]
455	[illegible]
456	[illegible]
457	[illegible]
458	[illegible]
459	[illegible]
460	[illegible]
461	[illegible]
462	[illegible]
463	[illegible]
464	[illegible]
465	[illegible]
466	[illegible]
467	[illegible]
468	[illegible]
469	[illegible]
470	[illegible]
471	[illegible]
472	[illegible]
473	[illegible]
474	[illegible]
475	[illegible]
476	[illegible]
477	[illegible]
478	[illegible]
479	[illegible]
480	[illegible]
481	[illegible]
482	[illegible]
483	[illegible]
484	[illegible]
485	[illegible]
486	[illegible]
487	[illegible]
488	[illegible]
489	[illegible]
490	[illegible]
491	[illegible]
492	[illegible]
493	[illegible]
494	[illegible]

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
495	45.1
496	41.0
497	36.2
498	31.9
499	26.6
500	21.2
501	16.6
502	11.6
503	6.4
504	1.6
505	0
506	0
507	0
508	0
509	0
510	0
511	1.9
512	5.6
513	8.9
514	10.5
515	13.7
516	15.4
517	16.9
518	19.2
519	22.5
520	25.7
521	28.5
522	30.6
523	32.3
524	33.8
525	35.4
526	37.0
527	38.3
528	39.4
529	40.1
530	40.2
531	40.2
532	40.2
533	40.2
534	40.2
535	40.2
536	41.2
537	41.5
538	41.8
539	41.2
540	40.6
541	40.2
542	40.2
543	40.2
544	39.3
545	37.2
546	31.9
547	26.6
548	21.2
549	15.9
550	10.6
551	5.2
552	0
553	0
554	0
555	0
556	0
557	0
558	0
559	0
560	0
561	0
562	0
563	0

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
564	0
565	0
566	0
567	0
568	0
569	5.3
570	10.6
571	15.9
572	20.9
573	23.5
574	25.7
575	27.4
576	27.4
577	27.4
578	28.2
579	28.5
580	28.5
581	28.2
582	27.4
583	27.2
584	26.7
585	27.4
586	27.5
587	27.4
588	26.7
589	26.6
590	26.6
591	26.7
592	27.4
593	28.3
594	29.8
595	30.9
596	32.5
597	33.8
598	34.0
599	34.1
600	34.8
601	35.4
602	36.0
603	36.2
604	36.2
605	36.2
606	36.5
607	38.1
608	40.4
609	41.8
610	42.6
611	43.5
612	42.0
613	36.7
614	31.4
615	26.1
616	20.8
617	15.4
618	10.1
619	4.8
620	0
621	0
622	0
623	0
624	0
625	0
626	0
627	0
628	0
629	0
630	0
631	0
632	0

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
633	0
634	0
635	0
636	0
637	0
638	0
639	0
640	0
641	0
642	0
643	0
644	0
645	0
646	3.2
647	7.2
648	12.6
649	16.4
650	20.1
651	22.5
652	24.6
653	28.2
654	31.5
655	33.8
656	35.7
657	37.5
658	39.4
659	40.7
660	41.2
661	41.8
662	42.0
663	42.2
664	42.2
665	42.5
666	42.6
667	42.6
668	41.8
669	41.0
670	38.0
671	34.4
672	29.8
673	26.4
674	23.3
675	18.7
676	14.0
677	9.3
678	5.6
679	3.2
680	0
681	0
682	0
683	0
684	0
685	0
686	0
687	0
688	0
689	0
690	0
691	0
692	0
693	0
694	2.3
695	5.3
696	7.1
697	10.5
698	14.8
699	18.2
700	21.7
701	23.5

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
702	26.4
703	26.9
704	26.6
705	26.6
706	29.3
707	30.9
708	32.3
709	34.6
710	36.2
711	36.2
712	35.6
713	36.5
714	37.5
715	37.8
716	36.2
717	34.6
718	33.0
719	29.0
720	24.1
721	19.3
722	14.5
723	10.0
724	7.2
725	4.8
726	3.4
727	0.8
728	0.8
729	5.1
730	10.5
731	15.4
732	20.1
733	22.5
734	25.7
735	28.0
736	31.5
737	34.6
738	37.2
739	39.4
740	41.0
741	42.6
742	43.6
743	44.4
744	44.9
745	45.5
746	46.0
747	46.0
748	45.5
749	45.4
750	45.1
751	44.3
752	43.1
753	41.0
754	37.8
755	34.6
756	30.6
757	26.6
758	24.0
759	20.1
760	15.1
761	10.0
762	4.8
763	2.4
764	2.4
765	0.8
766	0
767	4.8
768	10.1
769	15.4
770	20.8

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
771	25.4
772	28.2
773	29.6
774	31.4
775	33.3
776	35.4
777	37.3
778	40.2
779	42.6
780	44.3
781	45.1
782	45.5
783	46.5
784	46.5
785	46.5
786	46.3
787	45.9
788	45.5
789	45.5
790	45.5
791	45.4
792	44.4
793	44.3
794	44.3
795	44.3
796	44.3
797	44.3
798	44.3
799	44.4
800	45.1
801	45.9
802	48.3
803	49.9
804	51.5
805	53.1
806	53.1
807	54.1
808	54.7
809	55.2
810	55.0
811	54.7
812	54.7
813	54.6
814	54.1
815	53.3
816	53.1
817	52.3
818	51.5
819	51.3
820	50.9
821	50.7
822	49.2
823	48.3
824	48.1
825	48.1
826	48.1
827	48.1
828	47.6
829	47.5
830	47.5
831	47.2
832	46.5
833	45.4
834	44.6
835	43.5
836	41.0
837	38.1
838	35.4
839	33.0

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
840	30.9
841	30.9
842	32.3
843	33.6
844	34.4
845	35.4
846	36.4
847	37.3
848	38.6
849	40.2
850	41.8
851	42.8
852	42.8
853	43.1
854	43.5
855	43.8
856	44.7
857	45.2
858	46.3
859	46.5
860	46.7
861	46.8
862	46.7
863	45.2
864	44.3
865	43.5
866	41.5
867	40.2
868	39.4
869	39.9
870	40.4
871	41.0
872	41.4
873	42.2
874	43.3
875	44.3
876	44.7
877	45.7
878	46.7
879	47.0
880	46.8
881	46.7
882	46.5
883	45.9
884	45.2
885	45.1
886	45.1
887	44.4
888	43.8
889	42.8
890	43.5
891	44.3
892	44.7
893	45.1
894	44.7
895	45.1
896	45.1
897	45.1
898	44.6
899	44.1
900	43.3
901	42.8
902	42.6
903	42.6
904	42.6
905	42.3
906	42.2
907	42.2
908	41.7

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
909	41.2
910	41.2
911	41.7
912	41.5
913	41.0
914	39.6
915	37.8
916	35.7
917	34.8
918	34.8
919	34.9
920	36.4
921	37.7
922	38.6
923	38.9
924	39.3
925	40.1
926	40.4
927	40.6
928	40.7
929	41.0
930	40.6
931	40.2
932	40.2
933	40.2
934	39.8
935	39.4
936	39.1
937	39.1
938	39.4
939	40.2
940	40.2
941	39.6
942	39.6
943	38.8
944	39.4
945	40.4
946	41.2
947	40.4
948	38.6
949	35.4
950	32.3
951	27.2
952	21.9
953	16.6
954	11.3
955	6.0
956	0.6
957	0
958	0
959	0
960	3.2
961	8.5
962	13.8
963	19.2
964	24.5
965	28.2
966	29.9
967	32.2
968	34.0
969	35.4
970	37.0
971	39.4
972	42.3
973	44.3
974	45.2
975	45.7
976	45.9
977	45.9

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
978	45.9
979	44.6
980	44.3
981	43.8
982	43.1
983	42.6
984	41.8
985	41.4
986	40.6
987	38.6
988	35.4
989	34.6
990	34.6
991	35.1
992	36.2
993	37.0
994	36.7
995	36.7
996	37.0
997	36.5
998	36.5
999	36.5
1,000	37.8
1,001	38.6
1,002	39.6
1,003	39.9
1,004	40.4
1,005	41.0
1,006	41.2
1,007	41.0
1,008	40.2
1,009	38.8
1,010	38.1
1,011	37.3
1,012	36.9
1,013	36.2
1,014	35.4
1,015	34.8
1,016	33.0
1,017	28.2
1,018	22.9
1,019	17.5
1,020	12.2
1,021	6.9
1,022	1.6
1,023	0
1,024	0
1,025	0
1,026	0
1,027	0
1,028	0
1,029	0
1,030	0
1,031	0
1,032	0
1,033	0
1,034	0
1,035	0
1,036	0
1,037	0
1,038	0
1,039	0
1,040	0
1,041	0
1,042	0
1,043	0
1,044	0
1,045	0
1,046	0

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
1,047	0
1,048	0
1,049	0
1,050	0
1,051	0
1,052	0
1,053	1.9
1,054	6.4
1,055	11.7
1,056	17.1
1,057	22.4
1,058	27.4
1,059	29.8
1,060	32.2
1,061	35.1
1,062	37.0
1,063	38.6
1,064	39.9
1,065	41.2
1,066	42.6
1,067	43.1
1,068	44.1
1,069	44.9
1,070	45.5
1,071	45.1
1,072	44.3
1,073	43.5
1,074	43.5
1,075	42.3
1,076	39.4
1,077	36.2
1,078	34.6
1,079	33.2
1,080	29.0
1,081	24.1
1,082	19.8
1,083	17.9
1,084	17.1
1,085	16.1
1,086	15.3
1,087	14.6
1,088	14.0
1,089	13.8
1,090	14.2
1,091	14.5
1,092	14.0
1,093	13.8
1,094	12.9
1,095	11.3
1,096	8.0
1,097	6.8
1,098	4.2
1,099	1.6
1,100	0.9
1,101	0.2
1,102	1.0
1,103	2.6
1,104	5.8
1,105	11.1
1,106	16.1
1,107	20.6
1,108	22.5
1,109	23.3
1,110	25.7
1,111	29.1
1,112	32.2
1,113	33.8
1,114	34.1
1,115	34.3

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
1,116	34.4
1,117	34.9
1,118	36.2
1,119	37.0
1,120	38.3
1,121	39.4
1,122	40.2
1,123	40.1
1,124	39.9
1,125	40.2
1,126	40.9
1,127	41.5
1,128	41.8
1,129	42.5
1,130	42.8
1,131	43.3
1,132	43.5
1,133	43.5
1,134	43.5
1,135	43.3
1,136	43.1
1,137	43.1
1,138	42.6
1,139	42.5
1,140	41.8
1,141	41.0
1,142	39.6
1,143	37.8
1,144	34.6
1,145	32.2
1,146	28.2
1,147	25.7
1,148	22.5
1,149	17.2
1,150	11.9
1,151	6.6
1,152	1.3
1,153	0
1,154	0
1,155	0
1,156	0
1,157	0
1,158	0
1,159	0
1,160	0
1,161	0
1,162	0
1,163	0
1,164	0
1,165	0
1,166	0
1,167	0
1,168	0
1,169	3.4
1,170	8.7
1,171	14.0
1,172	19.3
1,173	24.6
1,174	29.9
1,175	34.0
1,176	37.0
1,177	37.8
1,178	37.0
1,179	36.2
1,180	32.2
1,181	26.9
1,182	21.6
1,183	16.3
1,184	10.9

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
1,185	5.0
1,186	0.3
1,187	0
1,188	0
1,189	0
1,190	0
1,191	0
1,192	0
1,193	0.0
1,194	0.0
1,195	0.0
1,196	0.0
1,197	0.3
1,198	2.4
1,199	5.6
1,200	10.5
1,201	15.8
1,202	19.3
1,203	20.8
1,204	20.9
1,205	20.3
1,206	20.6
1,207	21.1
1,208	21.1
1,209	22.5
1,210	24.9
1,211	27.4
1,212	29.9
1,213	31.7
1,214	33.8
1,215	34.6
1,216	35.1
1,217	35.1
1,218	34.6
1,219	34.1
1,220	34.6
1,221	35.1
1,222	35.4
1,223	35.2
1,224	34.9
1,225	34.6
1,226	34.6
1,227	34.4
1,228	32.3
1,229	31.4
1,230	30.9
1,231	31.5
1,232	31.9
1,233	32.2
1,234	31.4
1,235	28.2
1,236	24.9
1,237	20.9
1,238	16.1
1,239	12.9
1,240	9.7
1,241	6.4
1,242	4.0
1,243	1.1
1,244	0
1,245	0
1,246	0
1,247	0
1,248	0
1,249	0
1,250	0
1,251	0
1,252	1.6
1,253	1.6

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
1,254	1.6
1,255	1.6
1,256	1.6
1,257	2.8
1,258	4.8
1,259	6.4
1,260	8.0
1,261	10.1
1,262	12.9
1,263	16.1
1,264	16.9
1,265	15.3
1,266	13.7
1,267	12.2
1,268	14.2
1,269	17.7
1,270	22.5
1,271	27.4
1,272	31.4
1,273	33.8
1,274	35.1
1,275	35.7
1,276	37.0
1,277	38.0
1,278	38.8
1,279	39.4
1,280	39.4
1,281	38.6
1,282	37.8
1,283	37.8
1,284	37.8
1,285	37.8
1,286	37.8
1,287	37.8
1,288	38.6
1,289	38.8
1,290	39.4
1,291	39.8
1,292	40.2
1,293	40.9
1,294	41.2
1,295	41.4
1,296	41.8
1,297	42.2
1,298	43.5
1,299	44.7
1,300	45.5
1,301	46.7
1,302	46.8
1,303	46.7
1,304	45.1
1,305	39.8
1,306	34.4
1,307	29.1
1,308	23.8
1,309	18.5
1,310	13.2
1,311	7.9
1,312	2.6
1,313	0
1,314	0
1,315	0
1,316	0
1,317	0
1,318	0
1,319	0
1,320	0
1,321	0
1,322	0

SPEED VERSUS TIME SEQUENCE—Continued

Time (seconds)	Speed (kilometers per hour)
1,323	0
1,324	0
1,325	0
1,326	0
1,327	0
1,328	0
1,329	0
1,330	0
1,331	0
1,332	0
1,333	0
1,334	0
1,335	0
1,336	0
1,337	0
1,338	2.4
1,339	7.7
1,340	13.0
1,341	16.3
1,342	21.2
1,343	24.3
1,344	27.0
1,345	29.5
1,346	31.4
1,347	32.7
1,348	34.3
1,349	35.2
1,350	35.6
1,351	36.0
1,352	35.4
1,353	34.8
1,354	34.0
1,355	33.0
1,356	32.2
1,357	31.8
1,358	29.8
1,359	28.2
1,360	26.6
1,361	24.9
1,362	22.5
1,363	17.7
1,364	12.9
1,365	8.4
1,366	4.0
1,367	0
1,368	0
1,369	0
1,370	0
1,371	0

(d) EPA Urban Dynamometer Driving Schedule for Heavy-Duty Vehicles.

SPEED VERSUS TIME SEQUENCE

Record (sec)	Speed (mph)
0	0.0
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0
7	0.0
8	0.0
9	0.0
10	0.0
11	0.0
12	0.0
13	0.0
14	0.0
15	0.0
16	0.0
17	0.0
18	0.0
19	0.0
20	0.0
21	0.0
22	0.0
23	0.0
24	0.0
25	0.19
26	1.00
27	1.51
28	2.66
29	4.64
30	6.96
31	8.86
32	7.71
33	7.45
34	9.22
35	10.00
36	9.08
37	10.08
38	11.24
39	12.79
40	14.00
41	12.58
42	12.87
43	13.00
44	13.00
45	13.68
46	15.00
47	15.00
48	13.37
49	12.08
50	12.26
51	14.29
52	14.56
53	15.20
54	16.76
55	17.00
56	17.00
57	17.23
58	18.77
59	20.54
60	19.60
61	18.14
62	17.98
63	17.00
64	16.34
65	15.00
66	15.00
67	15.00
68	15.96
69	12.35
70	15.28
71	14.27
72	12.59
73	12.25
74	9.28
75	8.00
76	8.00

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
77	8.38
78	9.53
79	10.69
80	11.00
81	9.00
82	9.00
83	9.32
84	10.00
85	9.36
86	9.00
87	9.95
88	14.33
89	17.53
90	19.42
91	20.00
92	20.74
93	21.00
94	21.11
95	23.84
96	27.00
97	27.00
98	29.05
99	32.52
100	31.01
101	31.00
102	31.62
103	33.00
104	32.37
105	30.43
106	30.00
107	30.00
108	30.51
109	32.41
110	33.00
111	32.27
112	32.00
113	31.04
114	32.20
115	33.36
116	34.00
117	34.00
118	34.00
119	33.01
120	31.86
121	30.10
122	26.17
123	23.39
124	21.46
125	17.28
126	15.83
127	13.76
128	12.60
129	10.33
130	8.28
131	5.38
132	2.91
133	0.0
134	0.0
135	0.0
136	0.0
137	0.0
138	0.0
139	0.0
140	0.0
141	0.0
142	0.0
143	0.0
144	0.0
145	0.0

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
146	0.0
147	0.0
148	0.0
149	0.0
150	0.0
151	0.0
152	0.0
153	0.0
154	0.0
155	0.0
156	0.0
157	0.0
158	0.0
159	0.0
160	0.0
161	0.0
162	0.0
163	0.0
164	0.0
165	0.0
166	0.0
167	0.0
168	0.0
169	0.0
170	0.0
171	0.0
172	0.0
173	0.0
174	0.51
175	0.33
176	0.0
177	0.0
178	0.0
179	0.0
180	0.0
181	0.0
182	0.0
183	0.0
184	0.0
185	0.0
186	0.0
187	0.0
188	0.0
189	0.0
190	0.0
191	0.0
192	0.0
193	0.0
194	0.0
195	0.0
196	0.0
197	0.1
198	0.7
199	0.0
200	0.0
201	0.0
202	0.0
203	4.1
204	6.0
205	6.0
206	6.0
207	5.3
208	4.1
209	1.8
210	0.0
211	0.0
212	0.0
213	0.0
214	0.0

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
215	0.0
216	0.0
217	0.0
218	0.0
219	0.0
220	0.0
221	0.0
222	0.0
223	0.0
224	0.0
225	0.0
226	0.0
227	0.0
228	0.0
229	0.0
230	0.0
231	0.48
232	1.64
233	0.41
234	0.0
235	0.0
236	0.0
237	0.0
238	0.0
239	0.0
240	0.0
241	0.0
242	0.0
243	0.0
244	0.0
245	0.0
246	0.0
247	0.0
248	0.0
249	0.0
250	0.0
251	0.0
252	0.0
253	0.0
254	0.0
255	0.0
256	0.0
257	0.0
258	0.0
259	0.0
260	0.0
261	0.0
262	0.0
263	0.0
264	0.0
265	0.0
266	0.0
267	0.0
268	0.0
269	0.0
270	0.0
271	0.0
272	0.0
273	0.0
274	0.0
275	0.0
276	0.0
277	0.0
278	0.0
279	0.0
280	0.0
281	0.0
282	0.0
283	0.0

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
284	0.0
285	0.0
286	0.0
287	0.0
288	0.0
289	0.0
290	0.0
291	0.0
292	0.0
293	0.0
294	0.0
295	0.0
296	0.0
297	0.0
298	0.0
299	0.0
300	0.24
301	0.60
302	0.0
303	1.42
304	2.00
305	3.08
306	5.63
307	4.00
308	4.00
309	3.34
310	1.37
311	1.00
312	0.0
313	0.0
314	0.0
315	0.0
316	0.0
317	0.0
318	0.0
319	0.23
320	1.39
321	2.00
322	4.11
323	5.00
324	6.02
325	7.18
326	7.33
327	6.49
328	7.00
329	7.00
330	7.00
331	7.00
332	7.00
333	7.43
334	8.00
335	8.00
336	7.09
337	11.06
338	12.89
339	14.49
340	11.46
341	13.08
342	16.55
343	16.00
344	15.34
345	12.32
346	13.00
347	13.00
348	13.00
349	15.86
350	12.00
351	11.73
352	11.00

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
353	11.00
354	11.00
355	11.90
356	12.89
357	10.36
358	7.26
359	4.95
360	4.68
361	6.68
362	8.00
363	7.84
364	7.00
365	6.53
366	7.89
367	10.57
368	11.00
369	10.10
370	10.74
371	10.42
372	11.00
373	12.46
374	14.77
375	14.09
376	16.20
377	17.00
378	17.00
379	17.00
380	17.00
381	15.02
382	15.71
383	14.00
384	14.92
385	15.38
386	15.78
387	16.00
388	16.00
389	16.25
390	17.41
391	18.56
392	19.00
393	19.88
394	21.00
395	21.00
396	21.00
397	20.49
398	20.00
399	19.18
400	19.00
401	18.86
402	18.29
403	19.00
404	19.61
405	20.00
406	20.00
407	20.00
408	20.00
409	20.00
410	19.45
411	20.42
412	21.87
413	20.97
414	20.37
415	22.00
416	22.00
417	22.66
418	23.00
419	23.97
420	25.51
421	29.00

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
422	29.00
423	29.00
424	30.51
425	31.00
426	30.00
427	30.00
428	30.00
429	30.54
430	31.00
431	31.86
432	31.00
433	31.17
434	32.33
435	33.00
436	33.00
437	33.80
438	34.00
439	35.12
440	36.00
441	36.00
442	34.82
443	33.25
444	32.09
445	32.00
446	32.00
447	32.00
448	32.00
449	32.00
450	32.85
451	33.01
452	34.00
453	33.68
454	32.52
455	32.00
456	32.00
457	32.95
458	33.00
459	33.00
460	33.42
461	34.00
462	34.74
463	35.00
464	35.00
465	35.00
466	35.00
467	35.00
468	35.00
469	35.84
470	37.39
471	38.00
472	37.68
473	38.41
474	39.37
475	39.00
476	39.00
477	38.10
478	39.00
479	39.41
480	40.57
481	41.73
482	42.00
483	41.92
484	40.00
485	40.22
486	39.45
487	37.68
488	37.00
489	36.01
490	34.90

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
491	33.70
492	32.54
493	29.54
494	26.46
495	22.28
496	19.91
497	18.76
498	17.60
499	16.44
500	14.57
501	13.13
502	11.97
503	10.81
504	9.31
505	7.50
506	6.34
507	4.37
508	3.03
509	1.87
510	0.71
511	0.0
512	0.0
513	0.0
514	0.0
515	0.0
516	0.0
517	0.0
518	0.0
519	0.0
520	0.0
521	0.0
522	0.0
523	0.0
524	0.0
525	0.0
526	0.0
527	0.0
528	0.0
529	0.0
530	0.0
531	0.0
532	0.0
533	0.0
534	0.0
535	0.0
536	0.0
537	0.0
538	0.0
539	0.0
540	0.0
541	0.0
542	0.0
543	0.0
544	2.36
545	3.94
546	5.31
547	8.26
548	9.42
549	11.15
550	12.73
551	14.78
552	16.05
553	17.41
554	19.72
555	21.52
556	23.35
557	24.83
558	25.99
559	27.15

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
560	28.31
561	29.46
562	30.62
563	31.78
564	32.94
565	34.18
566	36.25
567	37.41
568	38.56
569	39.72
570	40.00
571	40.00
572	40.00
573	40.00
574	40.00
575	40.00
576	40.82
577	41.00
578	41.00
579	41.30
580	42.00
581	42.00
582	42.00
583	42.93
584	43.00
585	43.00
586	43.00
587	43.56
588	44.71
589	45.00
590	44.97
591	44.18
592	44.66
593	44.00
594	44.00
595	44.81
596	45.00
597	45.00
598	45.00
599	45.44
600	46.00
601	46.00
602	46.92
603	47.00
604	47.00
605	47.00
606	47.00
607	47.00
608	47.00
609	47.04
610	49.00
611	49.33
612	49.51
613	49.00
614	49.00
615	49.00
616	49.00
617	48.72
618	48.87
619	50.00
620	50.00
621	50.00
622	50.00
623	49.78
624	49.00
625	49.00
626	49.69
627	50.00
628	50.00

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
629	50.00
630	49.68
631	49.00
632	49.00
633	48.20
634	48.00
635	48.00
636	48.27
637	49.00
638	49.58
639	50.00
640	50.00
641	50.00
642	50.00
643	50.00
644	50.00
645	50.00
646	50.00
647	50.00
648	50.00
649	50.00
650	50.47
651	51.00
652	51.00
653	51.00
654	51.00
655	51.00
656	51.42
657	52.00
658	52.00
659	52.00
660	52.00
661	52.20
662	53.00
663	53.00
664	53.00
665	53.00
666	53.00
667	53.00
668	53.00
669	53.00
670	52.38
671	52.00
672	52.93
673	52.91
674	52.25
675	53.00
676	53.00
677	53.00
678	53.00
679	53.00
680	53.00
681	53.00
682	53.00
683	53.00
684	53.00
685	53.98
686	55.00
687	55.00
688	55.00
689	55.00
690	55.00
691	55.00
692	55.00
693	55.00
694	55.00
695	55.00
696	55.00
697	55.00

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
698	55.00
699	55.00
700	55.00
701	54.50
702	54.66
703	55.00
704	54.03
705	54.00
706	54.00
707	54.00
708	54.00
709	54.00
710	54.00
711	54.00
712	54.00
713	54.77
714	56.00
715	56.00
716	56.00
717	56.02
718	57.00
719	56.67
720	56.00
721	56.00
722	56.00
723	56.00
724	56.00
725	56.00
726	56.00
727	56.00
728	56.00
729	56.91
730	57.00
731	57.00
732	57.00
733	57.00
734	57.00
735	57.85
736	58.00
737	58.00
738	58.00
739	58.00
740	58.00
741	58.00
742	58.00
743	58.00
744	58.00
745	57.15
746	56.00
747	56.00
748	56.00
749	56.00
750	56.00
751	55.63
752	55.00
753	55.00
754	55.00
755	55.00
756	55.00
757	55.00
758	55.00
759	55.00
760	54.22
761	54.00
762	54.00
763	54.00
764	54.00
765	54.00
766	54.00

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
767	54.00
768	54.00
769	54.00
770	54.00
771	54.00
772	54.00
773	54.00
774	53.01
775	50.86
776	49.70
777	48.54
778	47.39
779	46.23
780	45.07
781	43.91
782	42.51
783	40.60
764	39.44
785	38.28
786	37.13
787	35.94
788	33.81
789	32.66
790	30.50
791	28.34
792	26.37
793	25.03
794	21.87
795	19.85
796	16.56
797	15.40
798	14.24
799	12.17
800	10.71
801	6.08
802	2.61
803	1.45
804	0.30
805	0.0
806	0.0
807	0.0
808	0.0
809	0.0
810	0.0
811	0.0
812	0.0
813	0.0
814	0.0
815	0.0
816	0.0
817	0.0
818	0.0
819	0.0
820	0.0
821	0.0
822	0.0
823	0.0
824	0.0
825	0.0
826	0.0
827	0.0
828	0.0
829	0.0
830	0.0
831	0.19
832	1.00
833	1.51
834	2.66
835	4.64

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
836	6.96
837	8.86
838	7.71
839	7.45
840	9.22
841	10.00
842	9.08
843	10.08
844	11.24
845	12.79
846	14.00
847	12.58
848	12.87
849	13.00
850	13.00
851	13.68
852	15.00
853	15.00
854	13.37
855	12.03
856	12.26
857	14.29
858	14.56
859	15.20
860	16.76
861	17.00
862	17.00
863	17.23
864	18.77
865	20.54
866	19.60
867	18.14
868	17.98
869	17.00
870	16.34
871	15.00
872	15.00
873	15.00
874	15.96
875	12.35
876	15.28
877	14.27
878	12.59
879	12.25
880	9.28
881	8.00
882	8.00
883	8.38
884	9.53
885	10.69
886	11.00
887	9.00
888	9.00
889	9.32
890	10.00
891	9.36
892	9.00
893	9.95
894	14.33
895	17.53
896	19.42
897	20.00
898	20.74
899	21.00
900	21.11
901	23.84
902	27.00
903	27.00
904	29.05

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
905	32.52
906	31.01
907	31.00
908	31.62
909	33.00
910	32.37
911	30.43
912	30.00
913	30.00
914	30.51
915	32.41
916	33.00
917	32.27
918	32.00
919	31.04
920	32.20
921	33.36
922	34.00
923	34.00
924	34.00
925	33.01
926	31.86
927	30.10
928	26.17
929	23.39
930	21.46
931	17.28
932	15.83
933	13.76
934	12.60
935	10.33
936	8.28
937	5.38
938	2.91
939	0.0
940	0.0
941	0.0
942	0.0
943	0.0
944	0.0
945	0.0
946	0.0
947	0.0
948	0.0
949	0.0
950	0.0
951	0.0
952	0.0
953	0.0
954	0.0
955	0.0
956	0.0
957	0.0
958	0.0
959	0.0
960	0.0
961	0.0
962	0.0
963	0.0
964	0.0
965	0.0
966	0.0
967	0.0
968	0.0
969	0.0
970	0.0
971	0.0
972	0.0
973	0.0

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
974	0.0
975	0.0
976	0.0
977	0.0
978	0.0
979	0.0
980	0.51
981	0.33
982	0.0
983	0.0
984	0.0
985	0.0
986	0.0
987	0.0
988	0.0
989	0.0
990	0.0
991	0.0
992	0.0
993	0.0
994	0.0
995	0.0
996	0.0
997	0.0
998	0.0
999	0.0
1000	0.0
1001	0.0
1002	0.0
1003	0.13
1004	0.71
1005	0.0
1006	0.0
1007	0.0
1008	0.0
1009	4.15
1010	6.00
1011	6.00
1012	6.00
1013	5.30
1014	4.14
1015	1.96
1016	0.0
1017	0.0
1018	0.0
1019	0.0
1020	0.0
1021	0.0
1022	0.0
1023	0.0
1024	0.0
1025	0.0
1026	0.0
1027	0.0
1028	0.0
1029	0.0
1030	0.0
1031	0.0
1032	0.0
1033	0.0
1034	0.0
1035	0.0
1036	0.0
1037	0.48
1038	1.64
1039	0.41
1040	0.0
1041	0.0
1042	0.0

SPEED VERSUS TIME SEQUENCE—Continued

Record (sec)	Speed (mph)
1043	0.0
1044	0.0
1045	0.0
1046	0.0
1047	0.0
1048	0.0
1049	0.0
1050	0.0
1051	0.0
1052	0.0
1053	0.0
1054	0.0
1055	0.0
1056	0.0
1057	0.0
1058	0.0
1059	0.0
1060	0.0

(e) [Reserved]

(f)(1) **EPA Engine Dynamometer Schedules for Heavy-duty Otto-cycle engines.**

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
1	0.0	0.0
2	0.0	0.0
3	0.0	0.0
4	0.0	0.0
5	0.0	0.0
6	0.0	0.0
7	0.0	0.0
8	0.0	0.0
9	0.0	0.0
10	0.0	0.0
11	0.0	0.0
12	0.0	0.0
13	0.0	0.0
14	0.0	0.0
15	0.0	0.0
16	0.0	0.0
17	0.0	0.0
18	0.0	0.0
19	0.0	0.0
20	0.0	0.0
21	0.0	0.0
22	0.0	0.0
23	0.0	0.0
24	0.0	0.0
25	7.00	44.40
26	16.00	85.40
27	27.00	97.80
28	38.00	100.00
29	45.00	100.00
30	51.00	100.00
31	54.00	97.50
32	53.00	90.00
33	49.00	75.20
34	45.00	50.00
35	40.00	10.00
36	34.00	2.30
37	27.00	0.0
38	21.00	2.30
39	16.00	12.00
40	12.00	35.30
41	8.50	4.90
42	5.00	−10.00
43	3.00	−10.00
44	0.0	0.0
45	0.0	0.0
46	0.0	0.0
47	0.0	0.0
48	0.0	0.0
49	0.0	0.0
50	0.0	0.0
51	3.00	10.00
52	11.00	40.20
53	20.00	53.00
54	27.50	64.80
55	32.00	78.00
56	32.00	78.00
57	27.50	56.00
58	26.00	24.40
59	24.00	−8.40
60	23.00	−10.00
61	24.00	−10.00
62	27.00	−10.00
63	34.00	−10.00
64	44.00	28.00
65	57.00	74.40
66	60.00	74.40
67	53.00	33.60
68	48.00	−10.00
69	44.00	−10.00
70	40.00	−10.00
71	40.00	7.00
72	44.00	22.70
73	46.00	30.00
74	46.00	32.00
75	44.00	25.00
76	40.00	18.00
77	37.00	14.00
78	36.00	10.00
79	34.00	0.0
80	34.00	−10.00
81	32.00	−10.00
82	31.00	−10.00
83	36.00	39.90
84	42.00	84.70
85	48.00	90.00
86	50.00	90.00
87	50.00	90.00
88	47.00	85.00
89	43.00	75.00
90	38.00	60.00
91	36.00	36.00
92	36.00	7.50
93	36.30	−10.00
94	45.00	64.50
95	53.00	67.00
96	58.00	64.50
97	62.00	60.30
98	63.00	55.50
99	62.00	52.30
100	61.00	47.00
101	55.00	44.00
102	50.00	39.00
103	45.00	36.00
104	40.00	34.00
105	36.00	30.00
106	34.00	25.80
107	32.00	20.00
108	30.00	14.60

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
109	26.00	10.00
110	23.00	0.0
111	18.00	−8.00
112	16.00	−10.00
113	18.00	−8.00
114	20.00	27.60
115	17.00	4.00
116	14.00	−8.00
117	12.00	−10.00
118	9.00	−10.00
119	7.00	−10.00
120	7.00	−10.00
121	5.00	−10.00
122	4.00	−10.00
123	3.00	−10.00
124	2.00	−8.00
125	0.0	0.0
126	0.0	0.0
127	0.0	0.0
128	0.0	0.0
129	0.0	0.0
130	5.00	8.00
131	8.00	16.30
132	10.00	27.50
133	8.00	27.50
134	5.00	9.00
135	2.00	1.80
136	0.0	0.0
137	0.0	0.0
138	0.0	0.0
139	0.0	0.0
140	0.0	0.0
141	0.0	0.0
142	0.0	0.0
143	0.0	0.0
144	0.0	0.0
145	0.0	0.0
146	0.0	0.0
147	0.0	0.0
148	0.0	0.0
149	2.00	4.80
150	1.00	4.50
151	0.0	0.0
152	0.0	0.0
153	0.0	0.0
154	0.0	0.0
155	0.0	0.0
156	0.0	0.0
157	0.0	0.0
158	0.0	0.0
159	0.0	0.0
160	0.0	0.0
161	0.0	0.0
162	0.0	0.0
163	0.0	0.0
164	0.0	0.0
165	0.0	0.0
166	0.0	0.0
167	8.00	27.00
168	18.00	65.00
169	23.00	82.50
170	23.00	88.00
171	21.00	88.00
172	18.00	81.30
173	17.00	32.00
174	15.00	−10.00
175	13.00	−10.00
176	11.00	−10.00
177	8.00	−10.00
178	6.00	−10.00
179	4.00	−10.00
180	2.00	−10.00
181	0.0	0.0
182	0.0	0.0
183	0.0	0.0
184	0.0	0.0
185	0.0	0.0
186	0.0	0.0
187	0.0	0.0
188	0.0	0.0
189	0.0	0.0
190	0.0	0.0
191	0.0	0.0
192	0.0	0.0
193	0.0	0.0
194	0.0	0.0
195	0.0	0.0
196	0.0	0.0
197	0.0	0.0
198	0.0	0.0
199	0.0	0.0
200	0.0	0.0
201	0.0	0.0
202	0.0	0.0
203	0.0	0.0
204	0.0	4.00
205	0.50	7.70
206	5.00	14.00
207	11.00	24.70
208	15.00	42.30
209	16.00	70.00
210	17.00	70.00
211	17.00	50.00
212	16.00	26.30
213	14.00	5.00
214	10.00	−10.00
215	10.00	−10.00
216	14.00	73.30
217	18.00	83.00
218	19.00	84.80
219	18.00	84.80
220	16.00	82.80
221	11.00	74.00
222	7.00	8.50
223	4.00	0.0
224	0.0	0.0
225	0.0	0.0
226	0.0	0.0
227	0.0	0.0
228	0.0	0.0
229	0.0	0.0
230	0.0	0.0
231	0.0	0.0
232	0.0	0.0
233	6.00	17.60
234	6.00	19.60
235	5.00	14.00
236	3.00	9.80
237	1.00	5.50
238	0.0	3.00
239	0.0	0.0
240	0.0	0.0
241	0.0	0.0
242	0.0	0.0
243	0.0	0.0
244	0.0	0.0
245	0.0	0.0
246	0.0	0.0

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
247	0.0	0.0
248	0.0	0.0
249	0.0	0.0
250	0.0	0.0
251	0.0	0.0
252	0.0	0.0
253	0.0	0.0
254	0.0	0.0
255	0.0	0.0
256	0.0	0.0
257	0.0	0.0
258	0.0	0.0
259	0.0	0.0
260	0.0	0.0
261	0.0	0.0
262	0.0	0.0
263	0.0	0.0
264	0.0	0.0
265	0.0	0.0
266	0.0	0.0
267	0.0	0.0
268	0.0	0.0
269	0.0	0.0
270	0.0	0.0
271	0.0	0.0
272	0.0	0.0
273	0.0	0.0
274	0.0	0.0
275	0.0	0.0
276	0.0	0.0
277	0.0	0.0
278	0.0	0.0
279	0.0	0.0
280	0.0	0.0
281	0.0	7.00
282	1.00	10.00
283	2.00	11.50
284	1.00	10.00
285	0.0	0.0
286	0.0	0.0
287	0.0	0.0
288	0.0	0.0
289	0.0	0.0
290	0.0	0.0
291	0.0	0.0
292	0.0	0.0
293	0.0	0.0
294	0.0	0.0
295	0.0	0.0
296	0.0	0.0
297	0.0	0.0
298	0.0	0.0
299	0.0	28.00
300	0.0	30.00
301	2.00	32.00
302	6.00	34.00
303	14.00	36.00
304	19.00	36.00
305	24.50	36.00
306	24.50	36.00
307	24.00	30.00
308	19.00	24.00
309	13.00	18.00
310	9.00	14.00
311	7.00	8.00
312	6.00	0.0
313	4.00	3.00
314	3.00	6.80
315	0.0	0.0
316	0.0	0.0
317	0.0	0.0
318	0.0	0.0
319	0.0	0.0
320	0.0	0.0
321	0.0	0.0
322	0.0	0.0
323	0.0	18.00
324	3.00	40.00
325	8.00	86.00
326	18.00	97.00
327	38.00	100.00
328	45.50	100.00
329	45.00	96.00
330	44.00	84.40
331	43.00	53.60
332	41.00	5.00
333	43.00	47.60
334	44.00	90.00
335	45.00	90.00
336	44.00	73.00
337	40.00	54.00
338	38.00	34.70
339	36.00	10.00
340	35.00	10.00
341	35.00	10.00
342	35.50	60.00
343	36.00	57.90
344	37.00	53.00
345	39.00	50.00
346	40.50	50.00
347	43.00	50.00
348	45.00	50.00
349	48.00	50.00
350	51.00	52.00
351	56.00	58.70
352	64.00	70.00
353	68.00	70.00
354	70.00	70.00
355	65.50	64.60
356	61.00	28.90
357	55.00	−5.00
358	50.00	−10.00
359	45.00	−10.00
360	38.00	−10.00
361	28.00	−10.00
362	19.00	−10.00
363	14.00	−10.00
364	7.00	−10.00
365	2.00	−5.00
366	3.00	5.00
367	7.00	25.00
368	9.00	38.00
369	7.00	17.00
370	4.00	2.00
371	3.00	−9.00
372	3.00	−10.00
373	11.00	70.00
374	15.00	97.60
375	16.00	100.00
376	19.00	100.00
377	26.00	100.00
378	29.00	95.00
379	25.00	63.00
380	19.00	−10.00
381	12.00	−10.00
382	8.00	−10.00
383	5.00	−10.00
384	2.00	−10.00

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
385	1.00	−10.00
386	0.0	0.0
387	0.0	0.0
388	0.0	0.0
389	0.0	0.0
390	0.0	0.0
391	0.0	0.0
392	0.0	0.0
393	0.0	0.0
394	0.0	0.0
395	0.0	0.0
396	0.0	0.0
397	0.0	0.0
398	0.0	0.0
399	0.0	0.0
400	0.0	0.0
401	0.0	0.0
402	0.0	0.0
403	0.0	0.0
404	0.0	0.0
405	0.0	0.0
406	0.0	0.0
407	0.0	0.0
408	0.0	0.0
409	0.0	0.0
410	0.0	0.0
411	0.0	0.0
412	0.0	0.0
413	0.0	0.0
414	0.0	0.0
415	0.0	0.0
416	0.0	0.0
417	0.0	0.0
418	0.0	0.0
419	4.00	20.00
420	4.00	20.00
421	0.0	0.0
422	0.0	0.0
423	0.0	0.0
424	0.0	0.0
425	0.0	0.0
426	0.0	0.0
427	0.0	0.0
428	0.0	0.0
429	0.0	0.0
430	2.00	0.0
431	6.00	2.00
432	14.00	28.80
433	20.00	30.00
434	24.40	11.00
435	24.00	10.00
436	24.00	12.00
437	28.00	52.00
438	32.00	52.00
439	34.00	46.00
440	34.00	30.00
441	34.50	30.00
442	35.00	30.00
443	36.00	35.00
444	39.00	40.00
445	45.00	50.00
446	49.00	56.00
447	50.00	−8.00
448	45.00	−10.00
449	39.00	−10.00
450	34.00	−10.00
451	28.00	−10.00
452	25.00	−10.00
453	21.00	−10.00
454	18.00	−10.00
455	15.00	−10.00
456	12.00	−10.00
457	18.00	−8.00
458	29.00	19.80
459	40.00	54.00
460	52.00	82.00
461	64.00	95.00
462	71.00	99.00
463	77.00	100.00
464	84.00	100.00
465	85.00	99.00
466	85.00	95.00
467	84.00	90.00
468	82.00	84.60
469	80.00	78.50
470	78.00	78.50
471	77.00	70.00
472	76.00	65.50
473	74.00	61.50
474	72.00	56.00
475	70.00	52.00
476	68.00	46.00
477	66.50	40.00
478	65.00	32.00
479	63.00	26.00
480	61.00	25.60
481	61.00	72.00
482	61.00	78.00
483	58.00	72.00
484	50.00	64.00
485	44.00	55.00
486	35.00	40.00
487	26.00	20.00
488	21.00	−4.00
489	18.00	−10.00
490	16.00	−10.00
491	19.00	−8.00
492	24.00	2.00
493	32.00	68.50
494	45.00	78.00
495	51.00	86.00
496	58.00	92.00
497	64.00	97.00
498	71.00	100.00
499	73.00	98.00
500	73.00	94.00
501	73.00	86.00
502	73.00	82.00
503	76.00	84.00
504	80.00	98.00
505	84.00	100.00
506	85.00	100.00
507	84.00	100.00
508	81.00	92.00
509	75.00	80.00
510	73.00	70.00
511	70.00	60.00
512	67.00	53.00
513	65.00	45.00
514	63.00	36.50
515	62.00	28.00
516	61.00	22.50
517	60.00	23.00
518	60.00	24.00
519	60.00	24.00
520	60.00	26.00
521	61.00	60.00
522	62.00	64.00

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
523	63.00	64.00
524	64.00	64.00
525	62.00	64.00
526	56.00	60.00
527	53.00	−7.00
528	49.00	−10.00
529	47.00	−10.00
530	46.00	−10.00
531	45.00	−7.00
532	45.00	30.00
533	46.00	50.00
534	46.00	50.00
535	47.00	50.00
536	47.00	50.00
537	47.00	30.00
538	46.00	12.00
539	45.00	10.50
540	44.00	10.00
541	41.00	10.00
542	37.00	9.00
543	36.00	2.00
544	35.00	−10.00
545	38.00	67.00
546	35.00	−10.00
547	31.00	15.00
548	28.00	55.00
549	34.00	44.00
550	35.00	38.50
551	36.00	38.50
552	36.00	38.50
553	37.00	38.50
554	39.00	36.00
555	42.00	27.00
556	45.00	62.00
557	48.00	45.00
558	51.00	15.00
559	51.00	8.00
560	51.00	6.00
561	48.00	10.00
562	46.00	11.00
563	44.00	13.00
564	41.00	17.00
565	37.00	20.00
566	34.00	20.00
567	30.00	17.00
568	26.00	14.00
569	23.00	7.00
570	19.00	2.00
571	15.00	−5.00
572	11.00	−10.00
573	8.00	−10.00
574	5.00	−8.00
575	2.00	−5.00
576	0.0	0.0
577	0.0	0.0
578	0.0	0.0
579	0.0	0.0
580	0.0	0.0
581	0.0	0.0
582	0.0	0.0
583	4.00	15.00
584	19.00	31.00
585	30.00	46.00
586	37.00	68.00
587	40.00	76.00
588	41.00	77.00
589	40.50	78.00
590	40.00	77.00
591	40.00	64.00
592	38.00	10.00
593	38.00	25.00
594	40.00	50.00
595	40.00	36.00
596	40.00	31.00
597	40.00	31.00
598	41.00	37.00
599	42.00	97.00
600	43.00	100.00
601	45.00	100.00
602	47.00	100.00
603	48.00	100.00
604	49.00	100.00
605	51.00	97.00
606	52.00	94.00
607	53.00	90.00
608	54.00	87.00
609	56.00	86.00
610	56.00	85.00
611	55.50	85.00
612	55.00	81.00
613	54.00	77.00
614	53.00	72.00
615	52.00	67.00
616	49.00	60.00
617	46.00	45.00
618	45.00	12.00
619	44.00	10.00
620	44.00	10.00
621	45.00	12.00
622	46.00	14.00
623	47.00	24.00
624	49.00	88.00
625	50.00	90.00
626	51.00	90.00
627	52.00	90.00
628	53.00	90.00
629	54.00	90.00
630	54.00	90.00
631	54.00	87.00
632	54.00	84.00
633	54.00	80.00
634	53.50	77.00
635	53.00	76.00
636	53.00	75.00
637	52.00	73.00
638	51.00	69.00
639	50.00	65.00
640	50.00	60.00
641	49.00	55.00
642	49.00	50.00
643	49.00	50.00
644	49.50	60.00
645	49.50	65.00
646	50.00	70.00
647	50.50	75.00
648	51.00	80.00
649	52.00	85.00
650	53.00	90.00
651	54.00	90.00
652	55.00	90.00
653	55.00	88.00
654	55.00	84.00
655	55.00	79.00
656	55.00	74.00
657	55.00	69.00
658	55.00	64.00
659	55.00	59.00
660	55.00	54.00

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
661	55.00	49.00
662	55.00	44.50
663	55.00	39.00
664	55.00	34.00
665	55.00	27.00
666	55.00	18.00
667	55.00	8.00
668	55.00	6.00
669	55.00	13.00
670	55.00	27.00
671	55.50	30.00
672	56.00	30.00
673	57.00	30.00
674	58.00	34.00
675	59.00	46.00
676	59.00	89.00
677	59.00	90.00
678	59.00	91.00
679	59.00	91.00
680	60.00	91.00
681	60.00	91.00
682	60.50	90.00
683	61.00	89.00
684	61.50	88.00
685	62.00	83.00
686	63.00	73.00
687	65.00	70.00
688	66.00	71.00
689	67.00	74.00
690	67.50	79.00
691	68.00	85.00
692	68.50	90.00
693	69.00	94.00
694	69.50	96.00
695	70.00	98.00
696	70.50	100.00
697	71.00	100.00
698	72.00	100.00
699	72.00	100.00
700	72.00	100.00
701	72.00	100.00
702	72.00	100.00
703	72.00	100.00
704	72.00	100.00
705	72.00	100.00
706	72.00	100.00
707	72.50	100.00
708	73.00	100.00
709	73.50	100.00
710	74.00	100.00
711	74.00	100.00
712	74.50	100.00
713	75.00	100.00
714	75.00	100.00
715	75.00	100.00
716	75.00	100.00
717	75.00	100.00
718	75.00	100.00
719	75.00	100.00
720	75.00	100.00
721	75.00	100.00
722	75.00	100.00
723	75.00	98.00
724	75.00	90.00
725	75.00	34.00
726	74.00	15.00
727	72.00	3.00
728	70.00	−7.00
729	69.00	−10.00
730	68.00	−10.00
731	70.50	53.00
732	73.00	80.00
733	75.00	88.00
734	77.00	94.00
735	79.00	97.00
736	82.00	97.00
737	85.00	98.00
738	85.00	98.00
739	87.00	97.00
740	90.00	95.00
741	92.00	90.00
742	93.00	88.00
743	94.00	86.00
744	95.00	83.00
745	96.00	79.00
746	97.00	74.00
747	98.00	68.00
748	99.00	62.00
749	100.00	54.00
750	100.00	30.00
751	100.00	22.00
752	100.00	20.00
753	100.00	22.00
754	100.00	30.00
755	100.00	65.00
756	100.00	76.00
757	100.00	80.00
758	100.00	78.00
759	100.00	72.00
760	100.00	54.00
761	95.00	30.00
762	85.00	12.00
763	68.00	−5.00
764	57.00	−9.00
765	56.00	−10.00
766	57.00	−9.00
767	57.00	−5.00
768	57.00	22.00
769	58.00	40.00
770	59.00	45.00
771	59.00	46.00
772	59.50	45.00
773	60.00	33.00
774	60.00	0.0
775	60.00	−10.00
776	60.00	−10.00
777	60.00	34.00
778	60.00	50.00
779	60.00	60.00
780	60.00	69.00
781	60.00	75.00
782	60.00	79.00
783	61.00	83.00
784	61.00	84.00
785	61.00	85.00
786	62.00	85.00
787	62.00	85.00
788	62.00	85.00
789	63.00	85.00
790	63.00	85.00
791	64.00	85.00
792	64.00	85.00
793	64.00	85.00
794	64.00	85.00
795	64.00	85.00
796	64.00	84.50
797	64.00	84.00
798	64.00	83.00

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
799	64.00	82.00
800	64.00	81.00
801	64.00	77.00
802	64.00	72.00
803	65.00	67.00
804	66.00	64.00
805	67.00	60.00
806	69.00	62.30
807	72.00	84.00
808	73.00	90.50
809	74.00	91.00
810	74.00	90.00
811	74.00	84.50
812	73.00	74.00
813	72.00	66.00
814	71.00	60.00
815	70.00	54.00
816	69.00	50.00
817	68.00	49.00
818	68.00	48.00
819	68.00	48.00
820	68.00	48.50
821	68.00	49.00
822	68.00	51.00
823	68.00	53.50
824	68.00	55.00
825	68.00	58.00
826	68.00	60.00
827	68.00	62.00
828	58.00	64.00
829	68.00	67.00
830	69.00	68.50
831	70.00	70.00
832	70.00	70.00
833	70.00	70.00
834	70.00	70.00
835	70.00	70.00
836	70.00	70.00
837	71.00	66.00
838	73.00	64.00
839	75.00	64.00
840	77.00	98.00
841	79.00	100.00
842	81.00	100.00
843	82.00	100.00
844	83.00	100.00
845	84.00	98.00
846	84.00	94.00
847	85.00	93.00
848	86.00	94.00
849	87.00	98.00
850	89.00	100.00
851	92.00	100.00
852	95.00	100.00
853	97.50	100.00
854	100.00	100.00
855	100.00	100.00
856	100.00	100.00
857	100.00	100.00
858	100.00	97.00
859	96.00	−6.00
860	94.00	−10.00
861	91.00	−10.00
862	88.00	−10.00
863	86.00	−10.00
864	84.00	−10.00
865	82.00	−10.00
866	79.00	−10.00
867	77.00	−10.00
868	75.00	−10.00
869	73.00	−10.00
870	72.00	−10.00
871	72.00	−10.00
872	72.00	−8.00
873	71.00	8.00
874	68.00	9.00
875	64.00	−9.00
876	58.00	−8.00
877	56.00	53.00
878	56.00	67.00
879	56.00	70.00
880	56.00	67.00
881	55.00	60.00
882	54.00	60.00
883	49.00	75.00
884	38.00	80.00
885	30.00	78.00
886	25.00	53.00
887	18.00	32.00
888	14.00	16.00
889	9.00	3.00
890	5.00	−6.00
891	1.00	−10.00
892	0.0	0.0
893	0.0	0.0
894	0.0	0.0
895	0.0	0.0
896	0.0	0.0
987	0.0	0.0
898	0.0	0.0
899	0.0	0.0
900	0.0	0.0
901	0.0	0.0
902	0.0	0.0
903	0.0	0.0
904	0.0	0.0
905	0.0	0.0
906	0.0	0.0
907	0.0	0.0
908	0.0	0.0
909	0.0	0.0
910	0.0	0.0
911	0.0	0.0
912	0.0	0.0
913	0.0	0.0
914	0.0	0.0
915	0.0	0.0
916	0.0	0.0
917	0.0	0.0
918	0.0	0.0
919	0.0	0.0
920	4.50	47.00
921	12.00	85.00
922	30.00	97.00
923	42.00	100.00
924	51.00	100.00
925	54.00	100.00
926	54.00	97.00
927	52.00	90.00
928	48.00	75.00
929	44.00	57.00
930	37.00	47.00
931	29.00	40.00
932	24.00	34.00
933	21.00	27.00
934	22.00	24.00
935	22.50	22.00
936	20.00	16.00

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
937	15.00	7.00
938	10.00	0.0
939	5.00	−7.00
940	2.00	−10.00
941	1.00	−10.00
942	0.0	0.0
943	0.0	0.0
944	0.0	0.0
945	1.00	0.0
946	5.00	20.00
947	15.00	43.00
948	28.00	52.00
949	34.00	64.00
950	37.00	74.00
951	37.50	90.00
952	37.00	56.00
953	36.00	27.00
954	35.00	−2.00
955	33.00	−8.00
956	29.00	−10.00
957	29.00	−8.00
958	29.00	−2.00
959	34.00	30.00
960	38.00	75.00
961	34.00	70.00
962	31.00	25.00
963	28.00	−7.00
964	26.00	−10.00
965	24.00	−7.00
966	23.00	4.00
967	23.00	22.00
968	24.00	30.00
969	23.00	32.00
970	22.00	25.00
971	18.00	18.00
972	16.00	14.00
973	15.00	10.00
974	15.00	0.0
975	15.00	−7.00
976	15.00	−10.00
977	18.00	−8.00
978	25.00	40.00
979	37.00	90.00
980	46.00	90.00
981	49.00	90.00
982	49.00	90.00
983	49.00	85.00
984	47.00	77.00
985	44.00	59.00
986	43.00	36.00
987	42.00	13.00
988	40.00	−10.00
989	41.00	65.00
990	44.00	65.00
991	45.00	65.00
992	45.00	62.00
993	44.00	56.00
994	42.00	46.00
995	41.00	36.00
996	39.00	20.00
997	38.00	4.00
998	37.00	33.00
999	38.00	39.00
1,000	36.00	40.00
1,001	35.00	40.00
1,002	33.00	39.00
1,003	30.00	36.00
1,004	27.00	33.00
1,005	22.00	24.00
1,006	21.00	−5.00
1,007	20.00	−10.00
1,008	18.00	−6.00
1,009	17.00	28.00
1,010	16.00	5.00
1,011	14.00	−5.00
1,012	12.00	−9.00
1,013	9.00	−10.00
1,014	7.00	−10.00
1,015	5.00	−10.00
1,016	4.00	−10.00
1,017	3.00	−10.00
1,018	2.00	−10.00
1,019	0.0	0.0
1,020	0.0	0.0
1,021	0.0	0.0
1,022	0.0	0.0
1,023	0.0	0.0
1,024	0.0	0.0
1,025	2.00	7.00
1,026	6.00	15.00
1,027	10.00	28.00
1,028	11.00	26.00
1,029	10.00	10.00
1,030	8.00	3.00
1,031	5.00	0.0
1,032	2.00	0.0
1,033	0.0	0.0
1,034	0.0	0.0
1,035	0.0	0.0
1,036	0.0	0.0
1,037	0.0	0.0
1,038	0.0	0.0
1,039	0.0	0.0
1,040	0.0	0.0
1,041	0.0	0.0
1,042	0.0	0.0
1,043	0.0	0.0
1,044	0.0	0.0
1,045	0.0	0.0
1,046	0.0	0.0
1,047	0.0	0.0
1,048	0.0	0.0
1,049	0.0	0.0
1,050	0.0	0.0
1,051	0.0	0.0
1,052	0.0	0.0
1,053	0.0	0.0
1,054	0.0	0.0
1,055	0.0	0.0
1,056	0.0	0.0
1,057	0.0	0.0
1,058	0.0	0.0
1,059	0.0	0.0
1,060	0.0	0.0
1,061	4.00	05.00
1,062	11.00	35.00
1,063	21.00	73.00
1,064	25.00	86.00
1,065	26.00	90.00
1,066	25.00	90.00
1,067	23.00	83.00
1,068	20.00	32.00
1,069	16.00	−6.00
1,070	14.00	−10.00
1,071	10.00	−10.00
1,072	7.00	−10.00
1,073	3.00	−10.00
1,074	1.00	−10.00

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
1,075	0.0	0.0
1,076	0.0	0.0
1,077	0.0	0.0
1,078	0.0	0.0
1,079	0.0	0.0
1,080	0.0	0.0
1,081	0.0	0.0
1,082	0.0	0.0
1,083	0.0	0.0
1,084	0.0	0.0
1,085	0.0	0.0
1,086	0.0	0.0
1,087	0.0	0.0
1,088	0.0	0.0
1,089	0.0	0.0
1,090	0.0	0.0
1,091	0.0	0.0
1,092	0.0	0.0
1,093	0.0	0.0
1,094	0.0	0.0
1,095	0.0	0.0
1,096	0.0	0.0
1,097	0.0	0.0
1,098	1.00	3.00
1,099	3.00	6.00
1,100	6.00	13.00
1,101	9.00	14.00
1,102	12.00	16.00
1,103	15.00	28.00
1,104	18.00	60.00
1,105	20.00	47.00
1,106	21.00	31.00
1,107	21.00	15.00
1,108	20.00	−2.00
1,109	20.00	−10.00
1,110	20.00	−2.00
1,111	20.00	70.00
1,112	21.00	83.00
1,113	22.00	84.00
1,114	22.00	83.00
1,115	18.00	78.00
1,116	14.00	68.00
1,117	8.00	10.00
1,118	4.00	4.00
1,119	1.00	0.0
1,120	0.0	0.0
1,121	0.0	0.0
1,122	0.0	0.0
1,123	0.0	0.0
1,124	0.0	0.0
1,125	0.0	1.00
1,126	1.00	5.00
1,127	5.00	18.00
1,128	9.00	19.00
1,129	12.00	18.00
1,130	12.00	15.00
1,131	9.00	10.00
1,132	5.00	5.00
1,133	2.00	2.00
1,134	0.0	0.0
1,135	0.0	0.0
1,136	0.0	0.0
1,137	0.0	0.0
1,138	0.0	0.0
1,139	0.0	0.0
1,140	0.0	0.0
1,141	0.0	0.0
1,142	0.0	0.0
1,143	0.0	0.0
1,144	0.0	0.0
1,145	0.0	0.0
1,146	0.0	0.0
1,147	0.0	0.0
1,148	0.0	0.0
1,149	0.0	0.0
1,150	0.0	0.0
1,151	0.0	0.0
1,152	0.0	0.0
1,153	0.0	0.0
1,154	0.0	0.0
1,155	0.0	0.0
1,156	0.0	0.0
1,157	0.0	0.0
1,158	0.0	0.0
1,159	0.0	0.0
1,160	0.0	0.0
1,161	0.0	0.0
1,162	0.0	0.0
1,163	0.0	0.0
1,164	0.0	0.0
1,165	0.0	0.0
1,166	0.0	0.0
1,167	0.0	0.0

(2) EPA Engine Dynamometer Schedule for Heavy-Duty Diesel Engines.

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
1	0.0	0.0
2	0.0	0.0
3	0.0	0.0
4	0.0	0.0
5	0.0	0.0
6	0.0	0.0
7	0.0	0.0
8	0.0	0.0
9	0.0	0.0
10	0.0	0.0
11	0.0	0.0
12	0.0	0.0
13	0.0	0.0
14	0.0	0.0
15	0.0	0.0
16	0.0	0.0
17	0.0	0.0
18	0.0	0.0
19	0.0	0.0
20	0.0	0.0
21	0.0	0.0
22	0.0	0.0
23	0.0	0.0
24	0.0	0.0
25	0.0	3.67
26	0.0	47.69
27	3.11	59.41
28	9.09	84.54
29	15.62	80.00
30	33.49	80.00
31	37.93	79.29
32	31.20	38.25
33	21.99	26.67

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
34	30.00	15.10
35	22.23	16.47
36	19.61	28.05
37	20.00	20.38
38	18.33	(1)
39	6.55	(1)
40	15.82	(1)
41	23.63	(1)
42	17.51	(1)
43	14.19	62.52
44	16.64	69.36
45	27.77	60.00
46	37.03	63.79
47	47.36	75.36
48	54.77	80.00
49	57.70	80.00
50	54.03	79.92
51	58.00	65.03
52	58.65	43.23
53	62.88	50.00
54	69.83	50.00
55	72.00	42.05
56	75.81	40.00
57	84.22	42.20
58	83.86	41.28
59	80.55	(1)
60	80.51	(1)
61	78.00	(1)
62	79.79	(1)
63	80.33	30.54
64	85.58	42.12
65	81.78	50.00
66	78.00	50.00
67	80.74	43.16
68	92.10	73.65
69	88.01	(1)
70	84.00	(1)
71	84.00	(1)
72	81.17	(1)
73	70.46	(1)
74	66.00	13.57
75	62.23	29.43
76	64.00	20.00
77	63.48	17.42
78	60.34	10.00
79	56.85	10.00
80	56.00	(1)
81	52.45	(1)
82	39.91	10.00
83	36.38	10.00
84	30.00	10.00
85	27.93	10.00
86	26.00	16.74
87	27.66	3.36
88	28.00	(1)
89	27.41	(1)
90	20.96	(1)
91	12.15	(1)
92	3.81	(1)
93	0.0	0.0
94	0.0	0.0
95	0.0	0.91
96	0.0	7.52
97	0.0	0.0
98	0.0	0.0
99	0.0	0.0
100	0.0	0.0
101	0.0	0.0
102	0.0	0.0
103	0.0	0.0
104	0.0	0.0
105	0.0	0.0
106	0.0	0.0
107	0.0	0.0
108	0.0	0.0
109	0.0	0.0
110	0.0	0.0
111	0.0	0.0
112	0.0	0.0
113	0.0	0.0
114	0.0	0.0
115	0.0	0.0
116	0.0	0.0
117	0.0	0.0
118	0.0	0.0
119	0.0	0.0
120	0.0	0.0
121	0.0	0.0
122	0.0	0.0
123	0.0	0.0
124	0.0	0.0
125	0.0	0.0
126	0.0	0.0
127	0.0	0.0
128	0.0	0.0
129	1.77	(1)
130	1.60	(1)
131	0.0	0.0
132	0.0	0.0
133	2.14	9.28
134	3.08	0.0
135	0.0	0.0
136	0.0	0.0
137	0.0	0.0
138	0.0	0.0
139	0.0	0.0
140	0.0	0.0
141	0.0	0.0
142	0.0	0.0
143	0.0	0.0
144	0.0	0.0
145	0.0	0.0
146	0.0	0.0
147	0.0	5.51
148	0.0	11.34
149	0.0	0.0
150	0.0	0.0
151	0.0	0.0
152	0.0	0.0
153	0.0	0.0
154	0.0	0.0
155	0.0	0.0
156	0.0	0.0
157	0.0	0.0
158	0.0	0.21
159	0.0	30.00
160	0.0	26.78
161	0.0	20.00
162	0.0	20.00
163	0.0	4.12
164	0.0	0.0
165	0.0	0.0
166	0.0	0.0
167	0.0	0.0
168	0.0	0.0
169	0.0	0.0
170	0.0	0.0
171	0.0	0.0

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
172	0.0	0.0
173	0.0	0.0
174	0.0	0.0
175	0.0	0.0
176	0.0	0.0
177	0.0	0.0
178	0.0	0.0
179	0.0	0.0
180	0.0	0.0
181	0.0	0.0
182	0.0	0.0
183	0.0	0.0
184	0.0	20.00
185	0.0	20.00
186	0.0	11.73
187	0.0	0.0
188	0.0	0.0
189	0.0	0.0
190	0.0	0.0
191	0.0	0.0
192	0.0	0.0
193	0.0	0.0
194	0.0	0.0
195	0.0	0.0
196	0.0	0.0
197	0.0	0.0
198	0.0	0.0
199	0.0	0.0
200	0.0	0.0
201	0.0	0.0
202	0.0	0.0
203	0.0	0.0
204	0.0	0.0
205	0.0	0.0
206	0.0	0.0
207	0.0	0.0
208	0.0	0.0
209	0.0	0.0
210	0.0	0.0
211	0.0	0.0
212	0.0	0.0
213	0.0	0.0
214	0.0	73.41
215	0.0	90.00
216	31.30	81.30
217	41.15	90.00
218	44.00	90.00
219	46.41	90.00
220	51.04	82.41
221	66.66	80.00
222	75.03	90.00
223	89.85	90.00
224	96.78	93.88
225	96.91	50.94
226	94.60	17.02
227	99.16	28.60
228	100.00	39.83
229	100.00	30.00
230	100.00	26.69
231	100.98	20.00
232	100.71	20.00
233	100.00	36.06
234	96.16	40.00
235	95.77	30.00
236	94.55	32.75
237	96.86	35.68
238	99.18	30.00
239	100.00	44.93
240	101.81	50.00
241	86.54	(1)
242	63.56	(1)
243	56.00	(1)
244	46.00	(1)
245	41.86	45.18
246	38.31	78.47
247	35.98	80.00
248	31.03	80.00
249	25.36	80.00
250	23.05	60.97
251	18.20	27.34
252	12.84	43.71
253	10.10	68.95
254	3.79	68.95
255	1.48	44.28
256	0.0	0.0
257	0.0	0.0
258	0.0	0.0
259	0.0	0.0
260	0.0	0.0
261	0.0	0.0
262	0.0	0.0
263	0.0	24.97
264	0.0	17.16
265	0.0	6.20
266	0.0	10.00
267	0.0	10.00
268	0.0	0.0
269	0.0	0.0
270	0.0	0.0
271	0.0	0.0
272	0.0	0.0
273	0.0	0.0
274	0.0	0.0
275	0.0	0.0
276	0.0	0.0
277	0.0	0.0
278	0.0	0.0
279	0.0	0.0
280	0.0	0.0
281	0.0	0.0
282	0.0	0.0
283	0.0	0.0
284	0.0	0.0
285	0.0	0.0
286	0.0	0.0
287	0.0	0.0
288	0.0	0.0
289	0.0	0.0
290	0.0	0.0
291	0.0	0.0
292	0.0	0.0
293	0.0	0.0
294	0.0	0.0
295	0.0	0.0
296	0.0	0.0
297	0.0	0.0
298	0.0	0.0
299	0.0	0.0
300	0.0	0.0
301	0.0	0.0
302	0.0	0.0
303	0.0	0.0
304	0.0	0.0
305	0.0	0.0
306	0.0	0.0
307	0.0	0.0
308	0.0	0.0
309	0.0	0.0

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
310	0.0	0.0
311	0.0	0.0
312	0.0	0.0
313	0.0	0.0
314	0.0	0.0
315	0.0	0.0
316	0.0	0.0
317	0.0	0.0
318	0.0	0.0
319	0.0	0.0
320	0.0	0.0
321	0.0	15.55
322	0.0	20.00
323	24.18	19.08
324	23.00	10.00
325	11.56	1.86
326	6.87	([1])
327	6.00	([1])
328	0.72	([1])
329	0.0	0.0
330	0.0	0.0
331	0.0	0.0
332	0.0	0.0
333	0.0	0.0
334	0.0	0.0
335	0.0	0.0
336	0.0	0.0
337	0.0	0.0
338	0.0	0.0
339	0.0	0.0
340	0.0	0.0
341	0.0	0.0
342	0.0	0.0
343	0.0	0.0
344	0.0	0.0
345	0.0	0.0
346	0.0	0.0
347	0.0	0.0
348	0.0	0.0
349	0.0	0.0
350	0.0	0.0
351	0.0	0.0
352	0.0	0.0
353	0.0	0.0
354	0.0	0.0
355	0.0	0.0
356	0.0	0.0
357	0.0	0.0
358	0.0	0.0
359	0.0	0.0
360	0.0	0.0
361	0.0	0.0
362	0.0	0.0
363	0.0	0.0
364	0.0	0.0
365	0.0	0.0
366	0.0	0.0
367	0.0	0.0
368	0.0	0.0
369	0.0	0.0
370	0.0	0.0
371	0.0	0.0
372	0.0	0.0
373	0.0	0.0
374	0.0	0.0
375	0.0	0.0
376	0.0	0.0
377	0.0	29.59
378	−1.50	87.46
379	8.88	100.00
380	46.04	100.00
381	76.89	100.00
382	80.00	100.00
383	82.14	94.64
384	85.39	83.07
385	87.70	88.51
386	92.00	79.83
387	92.00	61.66
388	94.58	66.77
389	102.88	60.00
390	106.00	72.76
391	109.18	8.43
392	111.91	([1])
393	82.00	([1])
394	79.33	([1])
395	71.15	([1])
396	68.84	([1])
397	78.35	49.17
398	82.00	70.00
399	80.65	69.46
400	92.85	60.00
401	97.48	60.00
402	98.95	60.00
403	100.74	60.00
404	103.68	43.17
405	104.00	10.04
406	80.62	20.00
407	83.37	20.00
408	81.06	15.29
409	80.00	10.00
410	76.86	([1])
411	74.11	([1])
412	71.60	([1])
413	70.58	([1])
414	78.00	([1])
415	80.29	1.45
416	80.54	17.30
417	78.23	11.13
418	78.45	19.55
419	84.36	24.16
420	72.16	80.00
421	79.10	74.83
422	90.09	16.04
423	74.04	([1])
424	68.02	([1])
425	68.53	([1])
426	59.39	([1])
427	63.54	([1])
428	70.00	2.38
429	73.10	17.76
430	72.13	([1])
431	67.27	([1])
432	36.03	([1])
433	20.75	([1])
434	11.49	([1])
435	−2.09	0.0
436	−0.73	0.0
437	8.57	60.00
438	30.55	61.93
439	67.10	63.00
440	86.03	39.85
441	89.33	30.00
442	91.64	30.00
443	97.88	10.40
444	97.73	1.37
445	96.00	10.00
446	96.00	0.96
447	96.00	([1])

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
448	85.27	28.34
449	87.54	30.76
450	86.16	29.18
451	88.00	20.00
452	87.21	20.00
453	86.00	20.00
454	87.42	20.00
455	88.00	11.32
456	77.84	(1)
457	72.00	(1)
458	71.32	(1)
459	70.00	0.04
460	70.00	(1)
461	74.88	(1)
462	74.06	(1)
463	67.74	(1)
464	66.00	(1)
465	64.23	(1)
466	62.00	(1)
467	55.94	(1)
468	54.00	(1)
469	66.43	(1)
470	75.21	70.00
471	86.00	54.53
472	86.00	24.56
473	88.81	(1)
474	90.00	(1)
475	105.48	(1)
476	74.00	(1)
477	73.34	(1)
478	71.02	10.00
479	76.46	29.38
480	81.61	40.00
481	78.16	30.39
482	74.13	26.46
483	90.00	0.0
484	90.87	0.0
485	92.00	(1)
486	93.50	(1)
487	94.00	(1)
488	94.13	(1)
489	88.96	(1)
490	63.25	(1)
491	62.00	(1)
492	49.54	45.37
493	52.49	86.99
494	64.00	90.00
495	64.99	90.00
496	71.93	93.22
497	78.87	95.21
498	82.00	83.64
499	86.76	80.00
500	93.71	80.00
501	94.87	80.00
502	103.60	80.00
503	101.23	41.89
504	95.48	24.85
505	98.00	50.00
506	99.79	50.00
507	106.21	46.82
508	110.84	(1)
509	98.55	(1)
510	70.95	(1)
511	67.27	(1)
512	60.96	(1)
513	48.03	(1)
514	52.31	(1)
515	54.00	(1)
516	65.27	(1)
517	78.00	(1)
518	57.61	(1)
519	42.58	(1)
520	38.81	(1)
521	22.37	(1)
522	3.52	(1)
523	0.0	0.0
524	−1.46	36.39
525	−0.23	5.75
526	0.0	0.0
527	0.0	0.0
528	0.0	0.0
529	0.0	0.0
530	0.0	0.0
531	0.0	0.0
532	0.0	0.0
533	0.0	0.0
534	0.0	0.0
535	0.0	0.0
536	0.0	0.0
537	0.0	0.0
538	0.0	0.0
539	0.0	0.0
540	0.0	0.0
541	0.0	0.0
542	0.0	0.0
543	0.0	0.0
544	0.0	(1)
545	0.0	0.0
546	−0.75	0.0
547	−0.56	0.0
548	4.00	(1)
549	0.68	(1)
550	0.0	0.0
551	0.0	0.0
552	0.0	2.60
553	0.0	20.00
554	0.0	20.00
555	0.0	7.96
556	0.0	0.0
557	0.0	0.0
558	0.0	78.53
559	1.85	60.00
560	11.10	63.88
561	16.00	70.00
562	30.05	70.00
563	42.88	70.00
564	56.10	70.00
565	63.39	66.52
566	70.66	59.94
567	72.98	80.00
568	77.87	86.46
569	88.03	90.00
570	90.00	90.00
571	92.23	100.00
572	94.00	100.00
573	94.86	100.00
574	96.00	100.00
575	97.49	100.00
576	108.84	100.00
577	110.00	83.92
578	104.77	(1)
579	87.50	(1)
580	90.00	0.0
581	91.38	(1)
582	81.84	(1)
583	65.99	(1)
584	63.68	(1)
585	60.73	(1)

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
586	57.05	(1)
587	53.47	(1)
588	50.42	(1)
589	44.31	(1)
590	37.58	37.91
591	33.48	20.00
592	31.16	20.00
593	28.85	20.00
594	22.13	20.00
595	9.31	(1)
596	0.0	0.0
597	0.0	0.0
598	0.0	0.0
599	0.0	0.0
600	0.0	0.0
601	0.0	0.0
602	0.0	0.0
603	0.0	0.0
604	0.0	0.0
605	0.0	0.0
606	2.52	6.30
607	10.30	17.87
608	13.89	20.00
609	20.20	20.00
610	24.07	22.59
611	33.33	17.50
612	40.30	(1)
613	47.85	(1)
614	66.00	7.78
615	68.00	10.93
616	67.59	32.04
617	66.00	40.00
618	67.04	40.00
619	68.00	40.00
620	68.00	48.33
621	75.93	99.53
622	78.00	100.00
623	78.00	100.00
624	77.07	100.00
625	76.00	100.00
626	76.00	100.00
627	76.00	100.00
628	75.63	100.00
629	73.00	97.50
630	76.81	90.00
631	80.26	90.00
632	83.44	90.00
633	84.00	98.79
634	84.00	100.00
635	83.61	100.00
636	82.00	100.00
637	83.02	94.91
638	86.67	90.00
639	89.65	90.00
640	90.00	99.81
641	89.45	100.00
642	86.00	100.00
643	86.00	95.47
644	87.22	90.00
645	88.00	90.00
646	88.00	80.74
647	88.00	79.17
648	88.00	77.21
649	88.00	100.00
650	88.00	94.45
651	88.00	90.00
652	88.00	90.00
653	90.00	90.00
654	89.63	90.00
655	88.68	90.00
656	90.00	90.00
657	90.00	90.00
658	91.63	81.86
659	92.00	80.00
660	90.00	81.29
661	89.43	92.86
662	87.11	100.00
663	86.00	100.00
664	86.00	100.00
665	89.66	100.00
666	90.00	99.27
667	90.46	90.00
668	92.78	90.00
669	95.09	90.00
670	100.22	82.97
671	102.00	80.00
672	102.00	70.18
673	102.00	80.00
674	97.34	50.07
675	87.02	(1)
676	86.00	(1)
677	73.12	22.19
678	75.77	39.62
679	75.76	48.80
680	75.11	37.23
681	78.00	34.34
682	80.37	40.00
683	77.51	47.49
684	81.44	50.00
685	82.13	39.36
686	84.00	27.79
687	84.00	16.21
688	84.00	15.36
689	85.39	26.93
690	86.00	30.00
691	86.00	30.08
692	85.67	40.00
693	84.65	40.00
694	86.00	35.20
695	87.28	30.00
696	88.00	22.05
697	86.09	(1)
698	83.78	(1)
699	81.47	(1)
700	81.70	(1)
701	85.16	(1)
702	84.52	(1)
703	82.21	(1)
704	79.89	(1)
705	77.58	(1)
706	76.00	6.31
707	79.16	0.0
708	75.16	27.36
709	72.00	40.00
710	72.00	40.00
711	74.00	38.44
712	74.00	30.00
713	74.00	30.00
714	74.00	36.28
715	72.43	47.86
716	68.23	59.43
717	73.80	50.00
718	72.52	50.00
719	74.00	45.85
720	72.85	57.18
721	76.38	62.70
722	81.55	60.00
723	80.18	60.00

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
724	83.60	60.00
725	83.44	56.40
726	86.00	50.00
727	87.35	50.00
728	86.34	50.00
729	86.00	40.11
730	88.29	61.47
731	88.78	63.92
732	86.92	50.00
733	86.76	50.00
734	87.55	42.24
735	88.00	49.34
736	86.00	50.91
737	86.00	67.45
738	86.00	81.88
739	87.13	70.00
740	89.44	77.21
741	91.76	88.78
742	90.07	89.65
743	92.00	80.00
744	92.70	80.00
745	94.00	80.00
746	94.00	80.00
747	94.00	80.00
748	94.00	80.00
749	94.00	81.37
750	94.59	87.05
751	96.00	57.40
752	96.00	42.19
753	96.00	42.33
754	96.00	40.00
755	96.00	38.37
756	96.00	12.83
757	96.00	(1)
758	96.00	(1)
759	96.00	(1)
760	97.74	7.37
761	100.05	19.74
762	102.00	11.83
763	102.00	26.81
764	103.00	49.96
765	104.00	60.00
766	102.37	60.00
767	103.94	60.00
768	104.00	40.00
769	104.00	25.75
770	103.12	(1)
771	100.80	(1)
772	100.00	(1)
773	101.83	44.88
774	102.00	36.40
775	102.00	(1)
776	102.00	(1)
777	100.91	(1)
778	101.40	(1)
779	100.28	(1)
780	97.97	(1)
781	96.00	(1)
782	96.00	10.00
783	96.00	0.23
784	96.00	(1)
785	96.00	(1)
786	94.08	(1)
787	78.00	(1)
788	77.45	(1)
789	71.67	28.96
790	67.18	80.00
791	66.50	87.48
792	71.43	90.00
793	74.13	90.00
794	75.56	92.20
795	74.75	100.00
796	77.07	94.65
797	79.38	83.08
798	80.00	71.51
799	80.01	69.93
800	82.33	58.36
801	84.00	50.00
802	84.00	59.58
803	84.00	76.36
804	84.00	80.00
805	84.00	70.49
806	82.00	80.00
807	81.47	82.66
808	80.00	90.00
809	77.68	90.00
810	74.52	75.24
811	77.58	78.96
812	81.89	80.00
813	80.42	80.00
814	82.00	83.68
815	83.05	79.50
816	84.00	70.00
817	84.00	61.60
818	84.00	50.03
819	86.00	60.00
820	86.00	60.00
821	86.00	69.39
822	88.51	73.73
823	88.43	70.00
824	88.00	70.00
825	94.00	70.99
826	94.51	80.00
827	95.17	80.00
828	95.14	80.00
829	94.54	80.00
830	94.00	80.00
831	94.00	77.89
832	94.00	31.99
833	94.00	43.57
834	94.00	60.28
835	94.00	63.29
836	94.00	76.57
837	94.00	89.86
838	94.29	90.00
839	97.80	87.00
840	102.91	80.00
841	104.00	73.85
842	104.00	62.28
843	104.00	69.29
844	106.00	70.00
845	106.00	62.70
846	106.00	40.00
847	104.88	40.00
848	104.00	32.85
849	104.00	30.00
850	104.00	0.30
851	103.63	11.87
852	100.62	13.12
853	98.00	5.01
854	96.68	10.00
855	96.00	(1)
856	96.00	(1)
857	96.00	(1)
858	95.43	(1)
859	94.00	(1)
860	94.00	(1)
861	95.52	5.18

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
862	97.83	(1)
863	98.00	(1)
864	98.00	(1)
865	97.22	(1)
866	96.00	6.35
867	96.00	12.98
868	96.00	10.00
869	95.93	10.00
870	92.00	10.00
871	92.00	10.00
872	92.98	14.89
873	94.00	13.54
874	90.79	42.12
875	88.08	40.40
876	86.23	30.00
877	88.00	32.75
878	87.14	44.32
879	84.82	50.00
880	82.51	50.00
881	82.00	50.00
882	82.12	40.00
883	83.13	35.64
884	80.00	20.00
885	84.26	51.95
886	86.62	66.21
887	84.31	60.00
888	81.99	9.96
889	79.35	1.61
890	75.36	19.56
891	73.05	40.00
892	70.73	8.35
893	68.42	(1)
894	47.15	8.95
895	35.79	10.00
896	32.95	7.38
897	29.16	(1)
898	16.47	(1)
899	2.13	(1)
900	0.0	0.0
901	0.0	0.0
902	0.0	0.0
903	0.0	0.0
904	0.0	0.0
905	0.0	0.0
906	0.0	0.0
907	0.0	0.0
908	0.0	0.0
909	0.0	0.0
910	0.0	0.0
911	0.0	0.0
912	0.0	0.0
913	0.0	0.0
914	0.0	0.0
915	0.0	0.0
916	0.0	0.0
917	0.0	0.0
918	0.0	0.0
919	0.0	0.0
920	0.0	0.0
921	0.0	0.0
922	0.0	0.0
923	0.0	0.0
924	0.0	0.0
925	0.0	0.0
926	0.0	0.0
927	0.0	3.67
928	0.0	47.69
929	3.11	59.41
930	9.09	84.54
931	15.62	80.00
932	33.49	80.00
933	37.93	79.29
934	31.20	38.25
935	21.99	26.67
936	30.00	15.10
937	22.23	16.47
938	19.61	28.05
939	20.00	20.38
940	18.33	(1)
941	6.55	(1)
942	15.82	(1)
943	23.63	(1)
944	17.51	(1)
945	14.19	62.52
946	16.64	69.36
947	27.77	60.00
948	37.03	63.79
949	47.36	75.36
950	54.77	80.00
951	57.70	80.00
952	54.03	79.92
953	58.00	65.03
954	58.65	43.23
955	62.88	50.00
956	69.83	50.00
957	72.00	42.05
958	75.81	40.00
959	84.22	42.20
960	83.86	41.28
961	80.55	(1)
962	80.51	(1)
963	78.00	(1)
964	79.79	(1)
965	80.33	30.54
966	85.58	42.12
967	81.78	50.00
968	78.00	50.00
969	80.74	43.16
970	92.10	73.65
971	88.01	(1)
972	84.00	(1)
973	84.00	(1)
974	81.17	(1)
975	70.46	(1)
976	66.00	13.57
977	62.23	29.43
978	64.00	20.00
979	63.48	17.42
980	60.34	10.00
981	56.85	10.00
982	56.00	(1)
983	52.45	(1)
984	39.91	10.00
985	36.38	10.00
986	30.00	10.00
987	27.93	10.00
988	26.00	16.74
989	27.66	3.36
990	28.00	(1)
991	27.41	(1)
992	20.96	(1)
993	12.15	(1)
994	3.81	(1)
995	0.0	0.0
996	0.0	0.0
997	0.0	0.91
998	0.0	7.52
999	0.0	0.0

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
1,000	0.0	0.0
1,001	0.0	0.0
1,002	0.0	0.0
1,003	0.0	0.0
1,004	0.0	0.0
1,005	0.0	0.0
1,006	0.0	0.0
1,007	0.0	0.0
1,008	0.0	0.0
1,009	0.0	0.0
1,010	0.0	0.0
1,011	0.0	0.0
1,012	0.0	0.0
1,013	0.0	0.0
1,014	0.0	0.0
1,015	0.0	0.0
1,016	0.0	0.0
1,017	0.0	0.0
1,018	0.0	0.0
1,019	0.0	0.0
1,020	0.0	0.0
1,021	0.0	0.0
1,022	0.0	0.0
1,023	0.0	0.0
1,024	0.0	0.0
1,025	0.0	0.0
1,026	0.0	0.0
1,027	0.0	0.0
1,028	0.0	0.0
1,029	0.0	0.0
1,030	0.0	0.0
1,031	1.77	(1)
1,032	1.60	(1)
1,033	0.0	0.0
1,034	0.0	0.0
1,035	2.14	9.28
1,036	3.08	0.0
1,037	0.0	0.0
1,038	0.0	0.0
1,039	0.0	0.0
1,040	0.0	0.0
1,041	0.0	0.0
1,042	0.0	0.0
1,043	0.0	0.0
1,044	0.0	0.0
1,045	0.0	0.0
1,046	0.0	0.0
1,047	0.0	0.0
1,048	0.0	0.0
1,049	0.0	5.51
1,050	0.0	11.34
1,051	0.0	0.0
1,052	0.0	0.0
1,053	0.0	0.0
1,054	0.0	0.0
1,055	0.0	0.0
1,056	0.0	0.0
1,057	0.0	0.0
1,058	0.0	0.0
1,059	0.0	0.0
1,060	0.0	0.21
1,061	0.0	30.00
1,062	0.0	26.78
1,063	0.0	20.00
1,064	0.0	20.00
1,065	0.0	4.12
1,066	0.0	0.0
1,067	0.0	0.0
1,068	0.0	0.0
1,069	0.0	0.0
1,070	0.0	0.0
1,071	0.0	0.0
1,072	0.0	0.0
1,073	0.0	0.0
1,074	0.0	0.0
1,075	0.0	0.0
1,076	0.0	0.0
1,077	0.0	0.0
1,078	0.0	0.0
1,079	0.0	0.0
1,080	0.0	0.0
1,081	0.0	0.0
1,082	0.0	0.0
1,083	0.0	0.0
1,084	0.0	0.0
1,085	0.0	0.0
1,086	0.0	20.00
1,087	0.0	20.00
1,088	0.0	11.73
1,089	0.0	0.0
1,090	0.0	0.0
1,091	0.0	0.0
1,092	0.0	0.0
1,093	0.0	0.0
1,094	0.0	0.0
1,095	0.0	0.0
1,096	0.0	0.0
1,097	0.0	0.0
1,098	0.0	0.0
1,099	0.0	0.0
1,100	0.0	0.0
1,101	0.0	0.0
1,102	0.0	0.0
1,103	0.0	0.0
1,104	0.0	0.0
1,105	0.0	0.0
1,106	0.0	0.0
1,107	0.0	0.0
1,108	0.0	0.0
1,109	0.0	0.0
1,110	0.0	0.0
1,111	0.0	0.0
1,112	0.0	0.0
1,113	0.0	0.0
1,114	0.0	0.0
1,115	0.0	0.0
1,116	0.0	73.41
1,117	0.0	90.00
1,118	31.30	81.30
1,119	41.15	90.00
1,120	44.00	90.00
1,121	46.41	90.00
1,122	51.04	82.41
1,123	66.66	80.00
1,124	75.03	90.00
1,125	89.85	90.00
1,126	96.78	93.88
1,127	96.91	50.94
1,128	94.60	17.02
1,129	99.16	28.60
1,130	100.00	39.83
1,131	100.00	30.00
1,132	100.00	26.69
1,133	100.98	20.00
1,134	100.71	20.00
1,135	100.00	36.06
1,136	96.16	40.00
1,137	95.77	30.00

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
1,138	94.55	32.75
1,139	96.86	35.68
1,140	99.18	30.00
1,141	100.00	44.93
1,142	101.81	50.00
1,143	86.54	(1)
1,144	63.56	(1)
1,145	56.00	(1)
1,146	46.00	(1)
1,147	41.86	45.18
1,148	38.31	78.47
1,149	35.98	80.00
1,150	31.03	80.00
1,151	25.36	80.00
1,152	23.05	60.97
1,153	18.20	27.34
1,154	12.84	43.71
1,155	10.10	68.95
1,156	3.79	68.95
1,157	1.48	44.28
1,158	0.0	0.0
1,159	0.0	0.0
1,160	0.0	0.0
1,161	0.0	0.0
1,162	0.0	0.0
1,163	0.0	0.0
1,164	0.0	0.0
1,165	0.0	24.97
1,166	0.0	17.16
1,167	0.0	6.20
1,168	0.0	10.00
1,169	0.0	10.00
1,170	0.0	0.0
1,171	0.0	0.0
1,172	0.0	0.0
1,173	0.0	0.0
1,174	0.0	0.0
1,175	0.0	0.0
1,176	0.0	0.0
1,177	0.0	0.0
1,178	0.0	0.0
1,179	0.0	0.0
1,180	0.0	0.0
1,181	0.0	0.0
1,182	0.0	0.0
1,183	0.0	0.0
1,184	0.0	0.0
1,185	0.0	0.0
1,186	0.0	0.0
1,187	0.0	0.0
1,188	0.0	0.0
1,189	0.0	0.0
1,190	0.0	0.0
1,191	0.0	0.0
1,192	0.0	0.0
1,193	0.0	0.0
1,194	0.0	0.0
1,195	0.0	0.0
1,196	0.0	0.0
1,197	0.0	0.0
1,198	0.0	0.0
1,199	0.0	0.0

[1] Closed rack motoring.

(3) **Optional EPA Engine Dynamometer Schedule for Heavy-duty Otto-cycle engines.**

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
1	0.0	0.0
2	0.0	0.0
3	0.0	0.0
4	0.0	0.0
5	0.0	0.0
6	0.0	0.0
7	0.0	0.0
8	0.0	0.0
9	0.0	0.0
10	0.0	0.0
11	0.0	0.0
12	0.0	0.0
13	0.0	0.0
14	0.0	0.0
15	0.0	0.0
16	0.0	0.0
17	0.0	0.0
18	0.0	0.0
19	0.0	0.0
20	0.0	0.0
21	0.0	0.0
22	0.0	0.0
23	0.0	0.0
24	0.0	0.0
25	−1.78	44.40
26	0.0	65.35
27	4.25	100.00
28	27.47	100.00
29	42.96	100.00
30	45.79	100.00
31	48.11	99.46
32	50.42	90.00
33	52.74	75.23
34	54.00	50.00
35	44.42	8.96
36	45.05	−10.00
37	46.00	9.99
38	37.68	−10.00
39	31.61	5.88
40	22.94	35.29
41	24.00	4.87
42	20.86	−10.00
43	12.45	−10.00
44	6.00	−10.00
45	6.52	−10.00
46	7.17	−10.00
47	2.56	−10.00
48	0.0	0.0
49	0.0	0.0
50	0.0	0.0
51	0.0	10.11
52	4.32	46.40
53	8.90	45.17
54	1.95	50.00
55	3.33	41.68
56	4.00	89.46
57	13.76	55.60
58	26.43	26.96
59	33.85	6.16
60	36.00	−10.00
61	34.45	−10.00
62	34.00	−10.00
63	35.64	−10.00
64	32.99	27.39
65	36.00	80.00
66	41.63	74.37
67	60.41	26.76
68	48.44	−10.00
69	43.86	−10.00

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
70	40.39	-10.00
71	38.50	4.01
72	35.05	30.00
73	40.66	16.70
74	43.64	26.45
75	45.96	-10.00
76	47.10	-10.00
77	49.29	-10.00
78	37.10	-10.00
79	36.00	-10.00
80	34.47	-10.00
81	32.15	-10.00
82	31.67	-10.00
83	28.48	13.89
84	32.38	90.00
85	36.00	90.00
86	41.69	90.00
87	45.74	90.00
88	49.95	80.00
89	49.10	80.00
90	50.59	62.97
91	45.99	34.98
92	42.76	7.23
93	35.12	-10.00
94	32.06	67.92
95	35.53	62.55
96	46.57	68.60
97	49.77	48.85
98	52.00	60.00
99	58.06	60.00
100	63.66	23.42
101	64.14	17.84
102	59.58	3.76
103	38.00	42.26
104	39.09	30.00
105	40.00	30.00
106	34.85	47.18
107	32.03	10.33
108	34.00	33.48
109	34.00	50.00
110	33.02	20.69
111	25.54	-10.00
112	15.57	-10.00
113	14.00	-10.00
114	14.47	27.64
115	18.00	4.49
116	17.13	-10.00
117	16.00	-10.00
118	10.02	-10.00
119	9.81	-10.00
120	5.88	-10.00
121	4.00	-10.00
122	4.00	-10.00
123	2.93	-10.00
124	0.62	-10.00
125	0.0	0.0
126	0.0	0.0
127	0.0	0.0
128	0.0	0.0
129	0.0	0.0
130	0.0	10.00
131	0.0	10.00
132	0.0	29.02
133	0.0	27.83
134	0.0	7.34
135	0.0	0.0
136	0.0	0.0
137	0.0	0.0
138	0.0	0.0
139	0.0	0.0
140	0.0	0.0
141	0.0	0.0
142	0.0	0.0
143	0.0	0.0
144	0.0	0.0
145	0.0	0.0
146	2.00	0.0
147	1.38	0.0
148	0.0	0.0
149	0.0	6.27
150	0.0	2.16
151	0.0	0.0
152	0.0	0.0
153	0.0	0.0
154	0.83	-10.00
155	2.00	-10.00
156	0.54	-10.00
157	0.0	0.0
158	0.0	0.0
159	0.0	0.0
160	0.0	0.0
161	0.0	0.0
162	0.0	0.0
163	0.0	0.0
164	0.0	0.0
165	0.0	0.0
166	0.0	0.0
167	0.0	22.01
168	1.23	72.29
169	6.63	80.00
170	17.29	89.29
171	22.17	90.00
172	24.00	82.70
173	24.00	31.96
174	24.00	-10.00
175	22.57	-10.00
176	22.00	-10.00
177	13.88	-10.00
178	10.00	-10.00
179	9.31	-10.00
180	3.99	-10.00
181	0.0	0.0
182	0.0	0.0
183	0.0	0.0
184	0.0	0.0
185	0.0	0.0
186	0.0	0.0
187	0.0	0.0
188	0.0	0.0
189	0.0	0.0
190	0.0	0.0
191	0.0	0.0
192	0.0	0.0
193	0.0	0.0
194	0.0	0.0
195	0.0	0.0
196	0.0	0.0
197	0.0	0.0
198	0.0	0.0
199	0.0	0.0
200	0.0	0.0
201	0.0	0.0
202	0.0	0.0
203	0.0	0.0
204	-2.52	6.30
205	-4.22	15.28
206	0.0	10.00
207	0.0	10.00

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
208	0.0	10.00
209	0.0	75.93
210	0.0	32.22
211	1.67	35.00
212	15.48	29.82
213	25.46	−10.00
214	24.22	−10.00
215	23.44	−10.00
216	12.41	80.00
217	8.94	83.61
218	7.26	84.82
219	16.70	80.00
220	24.67	63.33
221	0.24	79.81
222	0.0	8.52
223	0.0	0.0
224	0.0	0.0
225	0.0	0.0
226	0.0	0.0
227	0.0	0.0
228	0.0	0.0
229	0.0	0.0
230	0.0	0.0
231	0.0	0.0
232	0.0	0.0
233	0.0	17.59
234	0.0	19.63
235	0.0	10.00
236	0.0	10.00
237	0.0	10.00
238	0.0	3.34
239	0.0	0.0
240	0.0	0.0
241	0.0	0.0
242	0.0	0.0
243	0.0	0.0
244	0.0	0.0
245	0.0	0.0
246	0.0	0.0
247	0.0	0.0
248	0.0	0.0
249	0.0	0.0
250	0.0	0.0
251	0.0	0.0
252	0.0	0.0
253	0.0	0.0
254	0.0	0.0
255	0.0	0.0
256	0.0	0.0
257	0.0	0.0
258	0.0	0.0
259	0.0	0.0
260	0.0	0.0
261	0.0	0.0
262	0.0	0.0
263	0.0	0.0
264	0.0	0.0
265	0.0	0.0
266	0.0	0.0
267	0.0	0.0
268	0.0	0.0
269	0.0	0.0
270	0.0	0.0
271	0.0	0.0
272	0.0	0.0
273	0.0	0.0
274	0.0	0.0
275	0.0	0.0
276	0.0	0.0
277	0.0	0.0
278	0.0	0.0
279	0.0	0.0
280	0.0	0.0
281	0.0	4.17
282	1.15	10.00
283	2.00	10.00
284	0.22	10.00
285	0.0	0.0
286	0.0	0.0
287	0.0	0.0
288	0.0	0.0
289	0.0	0.0
290	0.0	0.0
291	0.0	0.0
292	0.0	0.0
293	0.0	0.0
294	0.0	0.0
295	0.0	0.0
296	0.0	0.0
297	0.0	0.0
298	0.0	0.0
299	0.0	0.0
300	0.0	4.07
301	0.0	10.00
302	0.0	17.22
303	0.0	20.00
304	0.0	20.37
305	2.33	31.94
306	16.22	36.48
307	24.00	24.81
308	24.00	13.34
309	19.06	10.00
310	18.00	−10.00
311	17.17	−10.00
312	9.04	−10.00
313	1.09	−10.00
314	0.0	0.0
315	0.0	0.0
316	0.0	0.0
317	0.0	0.0
318	0.0	0.0
319	0.0	0.0
320	0.0	0.0
321	0.0	0.0
322	0.0	0.0
323	0.0	0.82
324	0.37	41.08
325	2.68	90.00
326	6.00	94.99
327	11.94	100.00
328	15.63	100.00
329	41.26	90.28
330	46.26	90.00
331	44.56	67.08
332	36.00	1.12
333	27.58	50.12
334	23.52	90.00
335	24.00	90.00
336	26.29	70.00
337	30.00	65.38
338	30.00	34.47
339	30.00	10.00
340	30.00	10.00
341	30.00	10.00
342	30.18	60.00
343	40.00	58.25
344	40.67	50.00
345	41.02	50.00

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
346	40.00	50.00
347	41.61	50.00
348	42.00	50.00
349	46.00	50.00
350	48.22	50.00
351	59.21	58.69
352	67.18	70.00
353	71.00	70.00
354	72.00	70.00
355	72.13	68.08
356	74.89	28.94
357	68.91	−10.00
358	49.71	−10.00
359	41.84	−10.00
360	38.30	−10.00
361	35.93	−10.00
362	28.00	−10.00
363	23.48	−10.00
364	10.16	−10.00
365	4.72	−10.00
366	0.82	5.90
367	−9.53	19.53
368	2.20	45.60
369	20.53	7.33
370	21.15	0.0
371	17.67	−10.00
372	13.04	−10.00
373	8.41	79.70
374	10.33	100.00
375	17.27	100.00
376	22.00	100.00
377	25.16	100.00
378	29.37	100.00
379	36.73	66.35
380	40.00	−10.00
381	23.50	−10.00
382	9.37	−10.00
383	8.00	−10.00
384	6.74	−10.00
385	2.86	−10.00
386	0.11	−10.00
387	0.0	0.0
388	0.0	0.0
389	0.0	0.0
390	0.0	0.0
391	0.0	0.0
392	0.0	0.0
393	0.0	0.0
394	0.0	0.0
395	0.0	0.0
396	0.0	0.0
397	0.0	0.0
398	0.0	0.0
399	0.0	0.0
400	0.0	0.0
401	0.0	0.0
402	0.0	0.0
403	0.0	0.0
404	0.0	0.0
405	0.0	0.0
406	0.0	0.0
407	0.0	0.0
408	0.0	0.0
409	0.0	0.0
410	0.0	0.0
411	0.0	0.0
412	0.0	0.0
413	0.0	0.0
414	0.0	0.0
415	0.0	0.0
416	0.0	0.0
417	0.0	0.0
418	0.0	0.0
419	2.27	20.00
420	2.82	14.11
421	0.0	0.0
422	0.0	0.0
423	0.0	0.0
424	0.0	0.0
425	0.0	0.0
426	0.0	0.0
427	0.0	0.0
428	0.0	0.0
429	0.0	0.0
430	0.0	0.0
431	0.26	0.78
432	16.60	31.83
433	45.32	29.78
434	43.00	10.00
435	40.69	10.00
436	35.12	10.00
437	28.18	19.70
438	28.26	47.45
439	30.00	30.00
440	30.00	30.00
441	30.00	30.00
442	34.54	30.00
443	36.00	30.00
444	36.43	30.00
445	43.84	30.00
446	50.00	30.00
447	50.00	24.56
448	50.00	20.00
449	50.00	−10.00
450	37.97	−10.00
451	35.30	−10.00
452	30.68	−10.00
453	27.02	−10.00
454	26.00	−10.00
455	26.00	−10.00
456	20.24	−10.00
457	14.00	−10.00
458	13.45	18.27
459	9.40	52.99
460	10.72	81.81
461	15.50	97.48
462	19.62	100.00
463	20.25	100.00
464	25.76	100.00
465	35.02	100.00
466	42.14	94.65
467	44.00	90.00
468	45.70	90.00
469	51.99	60.00
470	50.00	60.00
471	51.29	63.22
472	54.96	70.00
473	56.00	70.00
474	62.35	38.25
475	71.61	30.00
476	76.22	50.00
477	78.00	50.00
478	78.00	41.53
479	55.93	12.58
480	38.52	0.0
481	34.42	71.65
482	36.11	79.47
483	38.84	67.90

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
484	42.74	60.00
485	44.00	54.75
486	49.46	36.35
487	52.00	30.00
488	32.05	−10.00
489	25.69	0.0
490	24.00	0.0
491	24.00	−10.00
492	20.24	−10.00
493	10.16	68.43
494	8.00	80.58
495	10.20	80.99
496	13.54	90.00
497	18.00	94.13
498	20.28	100.00
499	22.00	100.00
500	23.77	91.15
501	28.08	90.00
502	30.00	86.01
503	32.85	80.70
504	32.86	100.00
505	33.37	100.00
506	36.00	100.00
507	51.77	100.00
508	60.57	95.72
509	64.00	70.00
510	64.91	70.00
511	75.83	70.00
512	82.00	70.00
513	85.72	51.42
514	86.17	49.14
515	88.49	35.13
516	90.00	15.99
517	91.12	26.74
518	92.00	32.85
519	93.74	30.00
520	89.29	−10.00
521	66.00	41.87
522	67.38	56.88
523	80.02	54.96
524	93.95	66.34
525	97.63	63.69
526	94.11	60.00
527	85.66	−10.00
528	70.00	−10.00
529	69.11	−10.00
530	66.80	−10.00
531	64.48	−10.00
532	53.00	44.98
533	52.73	49.27
534	62.00	40.00
535	62.00	43.88
536	64.18	44.55
537	53.36	4.88
538	46.28	15.79
539	46.00	19.83
540	45.65	10.00
541	45.99	10.00
542	48.05	10.00
543	44.71	3.54
544	48.82	−10.00
545	51.92	66.82
546	47.53	−10.00
547	36.31	9.23
548	17.73	55.68
549	29.43	38.22
550	36.00	37.46
551	36.00	40.00
552	34.00	40.00
553	34.00	40.00
554	34.00	36.25
555	38.26	24.66
556	43.38	61.38
557	50.78	46.12
558	52.00	19.92
559	52.32	0.0
560	52.09	3.19
561	48.00	10.00
562	48.00	10.00
563	48.00	10.00
564	30.94	19.46
565	28.00	20.00
566	28.00	20.00
567	28.00	15.81
568	28.00	10.00
569	26.53	10.00
570	26.00	10.00
571	23.71	−10.00
572	17.59	−10.00
573	11.65	−10.00
574	1.92	−10.00
575	0.0	0.0
576	0.0	0.0
577	0.0	0.0
578	0.0	0.0
579	0.0	0.0
580	0.0	0.0
581	0.0	0.0
582	0.0	0.0
583	1.26	25.19
584	6.72	47.87
585	13.67	40.56
586	16.20	80.00
587	18.52	80.00
588	25.83	75.83
589	35.15	70.00
590	38.93	77.31
591	41.78	80.00
592	40.00	10.00
593	40.00	20.18
594	40.00	52.78
595	40.00	34.82
596	40.00	30.00
597	40.00	38.33
598	40.00	30.09
599	38.30	100.00
600	40.61	100.00
601	42.00	100.00
602	42.00	100.00
603	42.00	100.00
604	42.00	100.00
605	42.00	100.00
606	42.50	97.50
607	43.19	85.93
608	43.13	85.65
609	44.00	90.00
610	44.00	90.00
611	44.00	80.00
612	44.00	80.00
613	44.70	80.00
614	46.00	74.91
615	46.00	63.34
616	46.00	60.00
617	46.00	60.00
618	44.00	10.00
619	44.00	10.00
620	43.09	10.00
621	42.00	10.00

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
622	42.00	10.00
623	43.85	19.26
624	50.00	90.00
625	50.00	90.00
626	50.00	90.00
627	50.00	90.00
628	50.00	90.00
629	48.26	90.00
630	48.00	89.73
631	48.37	80.00
632	49.32	80.00
633	48.00	80.00
634	48.00	80.00
635	48.00	80.00
636	48.00	70.28
637	48.00	70.00
638	48.00	70.00
639	48.00	74.44
640	48.00	61.96
641	49.52	50.00
642	50.00	50.00
643	50.00	40.00
644	50.00	44.62
645	50.78	60.00
646	52.00	49.09
647	52.00	40.00
648	52.00	40.00
649	52.04	40.89
650	54.00	90.00
651	54.00	90.00
652	54.00	85.10
653	55.29	73.53
654	56.00	70.00
655	56.00	70.00
656	56.00	60.00
657	56.00	57.23
658	56.00	50.00
659	56.00	38.17
660	56.00	30.00
661	56.00	30.00
662	54.00	39.36
663	54.00	27.79
664	54.00	20.00
665	54.00	20.00
666	54.00	20.00
667	54.00	11.49
668	54.00	0.08
669	54.00	13.31
670	54.00	30.00
671	54.96	30.00
672	57.28	30.00
673	56.41	30.00
674	57.91	30.00
675	58.22	36.60
676	60.00	90.00
677	60.00	90.00
678	60.00	95.82
679	60.00	92.60
680	60.00	90.00
681	60.00	90.00
682	60.42	90.00
683	62.74	90.00
684	65.05	90.00
685	66.00	83.16
686	66.00	71.59
687	66.00	70.00
688	66.00	70.00
689	66.00	73.14
690	66.00	80.00
691	66.00	86.28
692	66.00	90.00
693	66.00	90.00
694	68.20	100.00
695	70.00	100.00
696	70.00	100.00
697	70.00	100.00
698	74.38	100.00
699	76.00	100.00
700	72.09	100.00
701	73.60	100.00
702	72.00	100.00
703	72.00	100.00
704	72.00	100.00
705	72.00	100.00
706	72.00	100.00
707	72.29	100.00
708	73.39	100.00
709	72.92	100.00
710	74.00	100.00
711	74.00	100.00
712	77.73	100.00
713	78.00	100.00
714	77.50	100.00
715	76.00	100.00
716	76.00	100.00
717	76.00	100.00
718	72.49	100.00
719	71.79	100.00
720	67.16	100.00
721	72.70	100.00
722	75.02	100.00
723	73.34	100.00
724	73.64	91.78
725	74.00	31.21
726	78.27	28.63
727	80.00	17.05
728	80.00	5.48
729	80.00	−10.00
730	80.00	−10.00
731	80.00	63.93
732	84.00	80.00
733	85.43	82.39
734	87.62	93.96
735	84.00	100.00
736	84.00	100.00
737	84.00	91.32
738	86.00	100.00
739	86.73	100.00
740	90.00	96.59
741	91.99	90.00
742	94.00	90.00
743	95.63	81.87
744	96.00	89.70
745	100.00	98.72
746	100.57	78.60
747	102.88	50.00
748	104.00	73.99
749	104.00	90.00
750	104.00	25.98
751	103.71	20.00
752	99.54	20.00
753	98.00	20.00
754	99.09	25.44
755	98.60	65.08
756	103.15	80.00
757	100.03	80.00
758	102.35	80.00
759	104.00	73.38

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
760	104.00	55.11
761	101.42	30.62
762	98.39	11.97
763	57.65	−10.00
764	58.00	−10.00
765	57.45	−10.00
766	56.00	−10.00
767	56.00	−10.00
768	56.00	27.39
769	56.00	40.00
770	56.00	50.00
771	56.00	45.60
772	56.00	33.77
773	56.00	40.00
774	60.15	5.40
775	62.00	−10.00
776	62.00	−10.00
777	62.00	41.64
778	62.00	59.65
779	62.00	75.21
780	62.00	76.36
781	62.00	80.00
782	62.00	80.00
783	62.00	80.00
784	62.00	80.00
785	61.15	80.00
786	60.00	80.00
787	60.00	87.38
788	60.00	90.00
789	60.00	90.00
790	60.00	90.00
791	60.00	90.00
792	60.00	90.00
793	60.00	83.17
794	60.00	80.00
795	60.00	89.97
796	62.31	90.00
797	64.00	86.88
798	64.00	80.00
799	64.00	80.00
800	64.00	80.00
801	64.00	80.00
802	66.00	70.00
803	66.51	70.00
804	68.00	65.87
805	68.00	60.00
806	68.00	60.00
807	73.31	86.55
808	74.00	90.00
809	74.00	90.00
810	73.29	90.00
811	72.00	84.86
812	73.34	73.29
813	74.00	70.00
814	72.03	70.00
815	71.71	50.00
816	70.00	50.00
817	70.00	50.00
818	68.77	56.15
819	68.00	60.00
820	68.00	60.00
821	68.00	58.28
822	68.00	40.00
823	68.00	48.01
824	68.00	60.00
825	68.00	60.00
826	68.00	60.00
827	68.00	60.00
828	68.00	61.87
829	68.00	70.00
830	69.00	70.00
831	70.00	70.00
832	70.00	70.00
833	70.00	70.00
834	70.00	70.00
835	70.00	70.00
836	70.00	70.00
837	73.61	70.00
838	76.00	62.41
839	76.00	60.00
840	76.00	100.00
841	76.92	100.00
842	80.78	100.00
843	82.00	100.00
844	83.40	100.00
845	84.00	100.00
846	83.97	90.00
847	82.35	90.00
848	85.33	93.31
849	89.95	100.00
850	88.13	100.00
851	89.21	100.00
852	95.76	100.00
853	100.23	100.00
854	102.00	100.00
855	104.59	100.00
856	112.71	100.00
857	113.01	100.00
858	112.00	100.00
859	104.00	−10.00
860	103.56	−10.00
861	102.75	−10.00
862	102.94	−10.00
863	99.24	−10.00
864	94.61	−10.00
865	93.99	−10.00
866	92.32	−10.00
867	93.36	−10.00
868	92.00	−10.00
869	90.73	−10.00
870	88.42	−10.00
871	84.21	−10.00
872	82.00	10.00
873	82.00	7.38
874	82.00	−10.00
875	82.00	−10.00
876	68.79	48.60
877	64.00	70.00
878	64.00	70.00
879	58.66	67.95
880	37.27	60.00
881	34.96	60.00
882	32.65	73.54
883	30.33	80.00
884	28.02	80.00
885	25.70	50.00
886	23.39	37.76
887	21.07	10.00
888	18.76	10.00
889	14.89	−10.00
890	12.13	−10.00
891	5.45	−10.00
892	0.0	0.0
893	0.0	0.0
894	0.0	0.0
895	0.0	0.0
896	0.0	0.0
897	0.0	0.0

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
898	0.0	0.0
899	0.0	0.0
900	0.0	0.0
901	0.0	0.0
902	0.0	0.0
903	0.0	0.0
904	0.0	0.0
905	0.0	0.0
906	0.0	0.0
907	0.0	0.0
908	0.0	0.0
909	0.0	0.0
910	0.0	0.0
911	0.0	0.0
912	0.0	0.0
913	0.0	0.0
914	0.0	0.0
915	0.0	0.0
916	0.0	0.0
917	0.0	0.0
918	0.0	0.0
919	0.0	0.0
920	−1.78	44.40
921	0.0	85.35
922	4.25	100.00
923	27.47	100.00
924	42.96	100.00
925	45.79	100.00
926	48.11	99.46
927	50.42	90.00
928	52.74	75.23
929	54.00	50.00
930	44.42	8.96
931	45.05	−10.00
932	46.00	9.99
933	37.69	−10.00
934	31.61	5.68
935	22.94	35.29
936	24.00	4.87
937	20.86	−10.00
938	12.45	−10.00
939	6.00	−10.00
940	6.52	−10.00
941	7.17	−10.00
942	2.56	−10.00
943	0.0	0.0
944	0.0	0.0
945	0.0	0.0
946	0.0	10.11
947	4.32	46.40
948	8.90	45.17
949	1.95	50.00
950	3.33	41.68
951	4.00	89.46
952	13.76	55.60
953	26.43	26.96
954	33.85	6.16
955	36.00	−10.00
956	34.45	−10.00
957	34.00	−10.00
958	35.64	−10.00
959	32.99	27.39
960	36.00	80.00
961	41.63	74.37
962	60.41	26.76
963	48.44	−10.00
964	43.86	−10.00
965	40.39	−10.00
966	38.50	4.01
967	35.05	30.00
968	40.66	16.70
969	43.64	26.45
970	45.96	−10.00
971	47.10	−10.00
972	49.29	−10.00
973	37.10	−10.00
974	36.00	−10.00
975	34.47	−10.00
976	32.15	−10.00
977	31.67	−10.00
978	28.48	13.89
979	32.38	90.00
980	36.00	90.00
981	41.69	90.00
982	45.74	90.00
983	49.95	80.00
984	49.10	80.00
985	50.59	62.97
986	45.99	34.98
987	42.76	7.23
988	35.12	−10.00
989	32.06	67.92
990	35.53	62.55
991	46.57	68.60
992	49.77	48.85
993	52.00	60.00
994	58.06	60.00
995	63.66	23.42
996	64.14	17.84
997	59.58	3.76
998	38.00	42.26
999	39.09	30.00
1,000	40.00	30.00
1,001	34.85	47.18
1,002	32.03	10.33
1,003	34.00	33.48
1,004	34.00	50.00
1,005	33.02	20.69
1,006	25.54	−10.00
1,007	15.57	−10.00
1,008	14.00	−10.00
1,009	14.47	27.64
1,010	18.00	4.49
1,011	17.13	−10.00
1,012	16.00	−10.00
1,013	10.02	−10.00
1,014	9.81	−10.00
1,015	5.88	−10.00
1,016	4.00	−10.00
1,017	4.00	−10.00
1,018	2.93	−10.00
1,019	0.62	−10.00
1,020	0.0	0.0
1,021	0.0	0.0
1,022	0.0	0.0
1,023	0.0	0.0
1,024	0.0	0.0
1,025	0.0	10.00
1,026	0.0	10.00
1,027	0.0	29.02
1,028	0.0	27.83
1,029	0.0	7.34
1,030	0.0	0.0
1,031	0.0	0.0
1,032	0.0	0.0
1,033	0.0	0.0
1,034	0.0	0.0
1,035	0.0	0.0

Record (seconds)	Percent	
	Normalized revolutions per minute	Normalized torque
1,036	0.0	0.0
1,037	0.0	0.0
1,038	0.0	0.0
1,039	0.0	0.0
1,040	0.0	0.0
1,041	2.00	0.0
1,042	1.38	0.0
1,043	0.0	0.0
1,044	0.0	6.27
1,045	0.0	2.16
1,046	0.0	0.0
1,047	0.0	0.0
1,048	0.0	0.0
1,049	0.83	−10.00
1,050	2.00	−10.00
1,051	0.54	−10.00
1,052	0.0	0.0
1,053	0.0	0.0
1,054	0.0	0.0
1,055	0.0	0.0
1,056	0.0	0.0
1,057	0.0	0.0
1,058	0.0	0.0
1,059	0.0	0.0
1,060	0.0	0.0
1,061	0.0	0.0
1,062	0.0	22.01
1,063	1.23	72.29
1,064	6.63	80.00
1,065	17.29	89.29
1,066	22.17	90.00
1,067	24.00	82.70
1,068	24.00	31.96
1,069	24.00	−10.00
1,070	22.57	−10.00
1,071	22.00	−10.00
1,072	13.88	−10.00
1,073	10.00	−10.00
1,074	9.31	−10.00
1,075	3.99	−10.00
1,076	0.0	0.0
1,077	0.0	0.0
1,078	0.0	0.0
1,079	0.0	0.0
1,080	0.0	0.0
1,081	0.0	0.0
1,082	0.0	0.0
1,083	0.0	0.0
1,084	0.0	0.0
1,085	0.0	0.0
1,086	0.0	0.0
1,087	0.0	0.0
1,088	0.0	0.0
1,089	0.0	0.0
1,090	0.0	0.0
1,091	0.0	0.0
1,092	0.0	0.0
1,093	0.0	0.0
1,094	0.0	0.0
1,095	0.0	0.0
1,096	0.0	0.0
1,097	0.0	0.0
1,098	0.0	0.0
1,099	−2.52	6.30
1,100	−4.22	15.28
1,101	0.0	10.00
1,102	0.0	10.00
1,103	0.0	10.00
1,104	0.0	75.93
1,105	0.0	32.22
1,106	1.67	35.00
1,107	15.48	29.82
1,108	25.46	−10.00
1,109	24.22	−10.00
1,110	23.44	−10.00
1,111	12.41	80.00
1,112	8.94	83.61
1,113	7.26	84.82
1,114	16.70	80.00
1,115	24.67	63.33
1,116	0.24	79.81
1,117	0.0	8.52
1,118	0.0	0.0
1,119	0.0	0.0
1,120	0.0	0.0
1,121	0.0	0.0
1,122	0.0	0.0
1,123	0.0	0.0
1,124	0.0	0.0
1,125	0.0	0.0
1,126	0.0	0.0
1,127	0.0	0.0
1,128	0.0	17.58
1,129	0.0	19.83
1,130	0.0	10.00
1,131	0.0	10.00
1,132	0.0	10.00
1,133	0.0	3.34
1,134	0.0	0.0
1,135	0.0	0.0
1,136	0.0	0.0
1,137	0.0	0.0
1,138	0.0	0.0
1,139	0.0	0.0
1,140	0.0	0.0
1,141	0.0	0.0
1,142	0.0	0.0
1,143	0.0	0.0
1,144	0.0	0.0
1,145	0.0	0.0
1,146	0.0	0.0
1,147	0.0	0.0
1,148	0.0	0.0
1,149	0.0	0.0
1,150	0.0	0.0
1,151	0.0	0.0
1,152	0.0	0.0
1,153	0.0	0.0
1,154	0.0	0.0
1,155	0.0	0.0
1,156	0.0	0.0
1,157	0.0	0.0
1,158	0.0	0.0
1,159	0.0	0.0
1,160	0.0	0.0
1,161	0.0	0.0
1,162	0.0	0.0
1,163	0.0	0.0
1,164	0.0	0.0
1,165	0.0	0.0
1,166	0.0	0.0
1,167	0.0	0.0

(Approved by the Office of Management and Budget under control number 2000-0390)

[42 FR 32989, June 28, 1977, as amended at 43 FR 52924, Nov. 14, 1978; 45 FR 4214, Jan. 21, 1980; 48 FR 1465, Jan. 12, 1983; 48 FR 52239, Nov. 16, 1983; 49 FR 48148, Dec. 10, 1984; 52 FR 47876, Dec. 16, 1987; 54 FR 14612, Apr. 11, 1989]

APPENDIX II [RESERVED]

APPENDIX III—CONSTANT VOLUME SAMPLER FLOW CALIBRATION

The following calibration procedure outlines the equipment, the test setup configuration, and the various parameters which must be measured to establish the flow rate of the constant volume sampler pump. All the parameters related to the pump are simultaneously measured with the parameters related to a flowmeter which is connected in series with the pump. The calculated flow rate (ft^3/rev@ pump inlet absolute pressure and temperature) can then be plotted versus a correlation function which is the value of a specific combination of pump parameters. The linear equation which relates the pump flow and the correlation function is then determined. In the event that a CVS has a multiple speed drive, a calibration for each range should be performed.

This calibration procedure is based on the measurement of the absolute values of the pump and flowmeter parameters that relate the flow rate at each point. Three conditions must be maintained to assure the accuracy and integrity of the calibration curve. First, the pump pressures should be measured at taps on the pump rather than at the external piping on the pump inlet and outlet. Pressure taps that are mounted at the top and bottom center of the pump drive headplate are exposed to the actual pump cavity pressures, and therefore reflect the absolute pressure differentials. Secondly, temperature stability must be maintained during the calibration. The laminar flowmeter is sensitive to inlet temperature oscillations which cause the data points to be scattered. Gradual changes (± 2°F) in temperature are acceptable as long as they occur over a period of several minutes. Finally, all connections between the flowmeter and the CVS pump must be absolutely void of any leakage.

During a CVS emissions test the measurement of these same pump parameters enables the user to calculate the flow rate from the calibration equation.

After the calibration curve has been obtained, a verification test of the entire system can be performed by injecting a known mass of gas into the system and comparing the mass indicated by the system to the true mass injected. An indicated error does not necessarily mean that the calibration is wrong, since other factors can influence the accuracy of the system.

Equipment:

The following list of equipment will be needed to perform this calibration procedure. Figure 1 illustrates a typical equipment arrangement used for calibration. All of the equipment involved should conform to the range and accuracy as specified in Figure 1.

Equipment List:

1. LFE—Laminar Flowmeter
2. Micromanometer
3. Thermometer
4. Timer
5. U-Tube Manometers
6. Temperature Indicator with type J Thermocouples
7. A variable flow restrictor with appropriate piping to connect the CVS pump and LFE.

After the system has been connected as shown in Figure 1, set the variable restrictor in the wide open position and run the CVS pump for twenty minutes. Record the calibration data.

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Tolerance
Barometric pressure (corrected)	P_B	"Hg	±.01 "Hg.
Ambient temperature	T_A	° F	±.5° F.
Air Temperature into LFE	ETI	° F	±.1° F.
Pressure depression upstream of LFE	EPI	"H20	±.1"H20.
Pressure drop across the LFE matrix	EDP	"H20	±.005"H20.
Air temperature at CVS pump inlet	PTI	° F	±.5° F.
Pressure depression at CVS pump inlet	PPI	"Fluid	±.05"Fluid.
Specific gravity of manometer fluid	Sp. Gr.		
Pressure head at CVS pump outlet	PPO	"Fluid	±.05"Fluid.
Air temperature at CVS pump outlet (optional)	PTO	° F	±.5° F.
Pump revolutions during test period	N	Revs	None.
Elapsed time for test period	t	Seconds	±.05 Seconds.

NOTE: The fluid level in the manometer tube should stabilize before the reading is made and the elapsed time for revolution counting should be greater than 120 seconds.

Reset the restrictor valve to a more restricted condition in an increment of pump inlet depression (about 4" H_2O) that will yield a minimum of six data points for the total calibration.

Allow the system to stabilize for 3 minutes and repeat the data acquisition.

Data Analysis:

The data recorded during the calibration are to be used in the following calculations.

1. The air flow rate at each test point is calculated in standard cubic feet per minute (Qs) from the flowmeter data using the manufacturer's prescribed method.

2. The air flow rate is then converted to pump flow, Vo, in cubic feet per revolution at absolute pump inlet temperature and pressure.

$$V_o = Qs/n \times T_p/530 \times 29.92/P_p$$

where:

Qs=Meter air flow rate in standard cubic feet per minute (flowmeter standard conditions are 70°F, 29.92 "Hg).

n=Pump speed in revolutions per minute.

P_p=Absolute pump inlet pressure, in ("Hg).

$P_p = P_B - PPI\ (SP.GR./13.57)$, $T_p = PTI + 460$.

3. The correlation function at each test point is then calculated from the calibration data, as follows:

$$X_o = \frac{1}{n}\sqrt{\frac{\Delta P_p}{P_e}}$$

ΔP_p=The pressure differential from pump inlet to pump outlet in ("Hg).

$$\Delta P_p = P_e - P_p$$

P_e=Absolute pump outlet pressure, in ("Hg).

$$P_p = P_B + PPO\ (Sp.\ Gr./13.57)$$

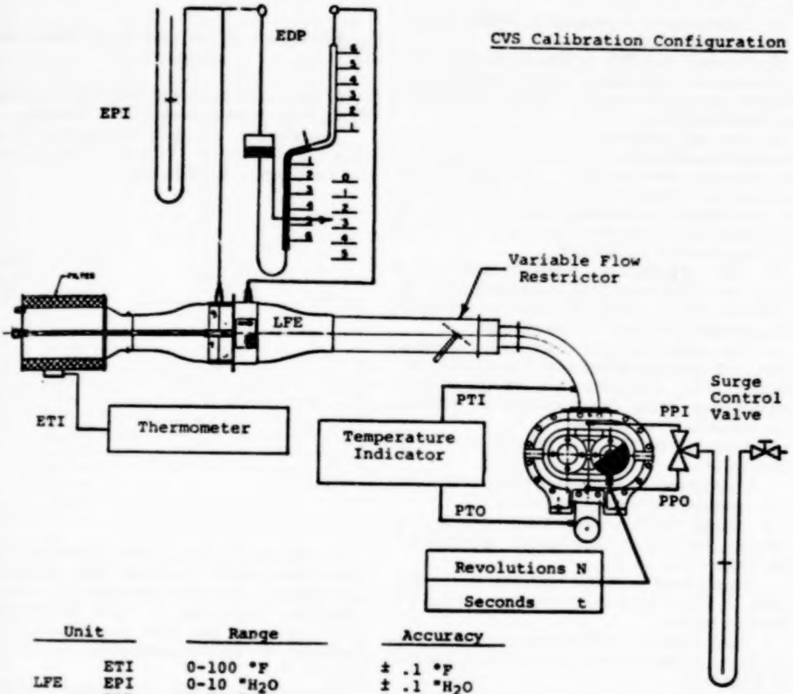
See § 86.177-22 for other definitions.

4. A linear least squares fit is performed to generate the calibration equations which have the forms

$$V_o = D_o - M(X_o)$$
$$n = A - B(P_p)$$

Do, M, A, and B are the slope-intercept constants describing the lines.

A CVS system that has multiple speeds should be calibrated on each speed used. The calibration curves generated for the ranges will be approximately parallel and the intercept values, D_o, will increase as the pump flow range decreases.


CVS Calibration Configuration
EDP
EPI
6
5
4
3
2
1
1
2
3
4
5
6
0
1
2
3
4
5
Variable Flow Restrictor
LFE
ETI
Thermometer
Temperature Indicator
PTI
PTO
PPI
PPO
Surge Control Valve
Revolutions N
Seconds t

Unit		Range	Accuracy
	ETI	0-100 °F	± .1 °F
LFE	EPI	0-10 "H_2O	± .1 "H_2O
	EDP	0-10 "H_2O	± .005 "H_2O
	PTI	0-250 °F	± .5 °F
	PPI	0-36 "Fluid	± .05 "Fluid
	PPO	0-36 "Fluid	± .05 "Fluid
Pump	PTO	0-250 °F	± .5 °F
	N	0-100,000	± 0
	t	0-10,000 secs.	± .05 secs.

Note: Fluid used in 36 inch manometer should extend range to at least 0-60 "H_2O. Separate manometers for PPI and PPO may be used during calibration.

Figure I—CVS Calibration Configuration

If the calibration has been performed carefully, the calculated V_o values from the equation will be within ±.50% of the measured value of V_o. Values of M will vary from one pump to another, but values of D_o for pumps of the same make, model, and range should agree within ±3 percent of each other. Particulate influx from use will cause the pump slip to decrease as reflected by lower values for M. Calibrations should be performed at 0, 30, 100, 200, 400, etc. hours of pump operation to assure the stability of the pump slip rate. Analysis of mass injection data will also reflect pump slip stability.

CVS System Verification:

The following technique can be used to verify that the CVS and analytical instruments can accurately measure a mass of gas that has been injected into the system.

1. Obtain a small cylinder that has been charged with pure propane or carbon monoxide gas (caution—carbon monoxide is poisonous!). Critical flow orifice devices can also be used for constant flow metering.

2. Determine a reference cylinder weight to the nearest 0.01 gram.

3. Operate the CVS in the normal manner and release a quantity of pure propane or carbon monoxide into the system during the sampling period.

4. The calculations of § 86.177-22 are performed in a normal way except, in the case of propane, the density of propane (17.30 grams/cu./ft./carbon atom) is used in place of the density of exhaust hydrocarbons. In the case of carbon monoxide, the density of 32.97 grams/cu. ft. is used.

5. The gravimetric mass is subtracted from the CVS measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

6. The cause for any discrepancy greater than ±2 percent should be found and corrected. The following list of parametric errors may assist the operator in locating the cause of large errors.

Positive Error (Indication is higher than true value):

1. Calculated V_o is greater than actual V_o.

a. Original calibration in error.

2. Pump inlet temperature recorder is reading low. A 6° F. discrepancy will give a 1 percent error.

3. Pump inlet pressure indicator is reading high. A 3.5 in. H_2O high reading will give 1 percent error.

4. Background concentration reading is too low. Check analyzer zero. Check leakage at floor inlet.

5. Analyzer is reading high. Check span.

6. Barometer reading is in error (too high). Barometric pressure reading should be gravity and temperature corrected.

7. Revolution counter is reading high (Check pump speed and counters.)

8. Mixture is stratified causing the sample to be higher than the average concentration in the mixture. Negative Error (Indication is lower than true value):

1. Calculated V_o is less than actual V_o.

a. Original calibration in error.

b. Pump clearances decreased due to influx of some surface adherent material. Recalibration may be needed.

2. Pump inlet temperature recorder is reading high.

3. Pump inlet pressure indicator is reading low.

4. Background concentration reading is too high.

5. Analyzer is reading low.

6. Barometer reading is in error (too low).

7. Revolution counter is reading low.

8. There is a leak into the sampling system. Pressure check the lines and fittings on the intake side of sample transfer pumps on both the CVS and analyzer console.

[42 FR 33000, June 28, 1977]

APPENDIX IV—DURABILITY DRIVING SCHEDULES

(a) Durability Driving Schedule for Light-Duty Vehicles and Light-Duty Trucks.

The schedule consists basically of 11 laps of a 3.7 mile course. The basic vehicle speed for each lap is listed below:

Lap	Speed miles per hour
1	40
2	30
3	40
4	40
5	35
6	30
7	35
8	45
9	35
10	55
11	70

During each of the first nine laps there are 4 stops with 15 second idle. Normal accelerations and decelerations are used. In addition, there are 5 light decelerations each lap from the base speed to 20 m.p.h. followed by light accelerations to the base speed.

The 10th lap is run at a constant speed of 55 m.p.h.

The 11th lap is begun with a wide open throttle acceleration from stop to 70 m.p.h. A normal deceleration to idle followed by a second wide open throttle acceleration occurs at the midpoint of the lap.

(b) Durability Driving Schedule for Motorcycles. The Durability Driving Schedule for Class III Motorcycles may be used for Light-Duty Vehicles and Light-Duty Trucks.

The schedule consists basically of 11 laps of a 6.0 km (3.7 mi) course. The basic vehicle speed for each lap is listed below:

SPEED (kilometers per hour)

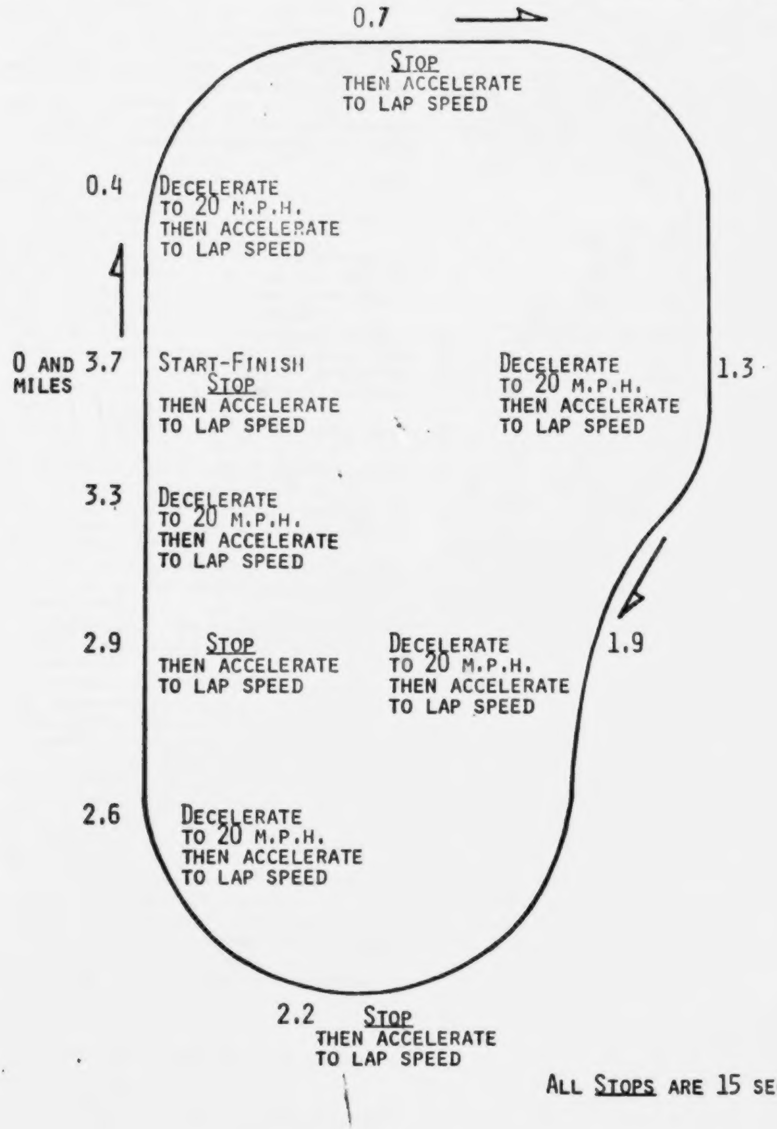
Lap	Class I	Class II	Class III
1	65	65	65
2	45	45	65
3	65	65	55
4	65	65	45
5	55	55	55
6	45	45	55
7	55	55	70
8	70	70	55
9	56	55	46
10	70	90	90
11	70	90	110

During each of the first nine laps there are 4 stops with 15 second idle. Normal accelerations and decelerations are used. In addition, there are 5 light declerations each lap from the base speed to 30 km/h followed by light accelerations to the base speed.

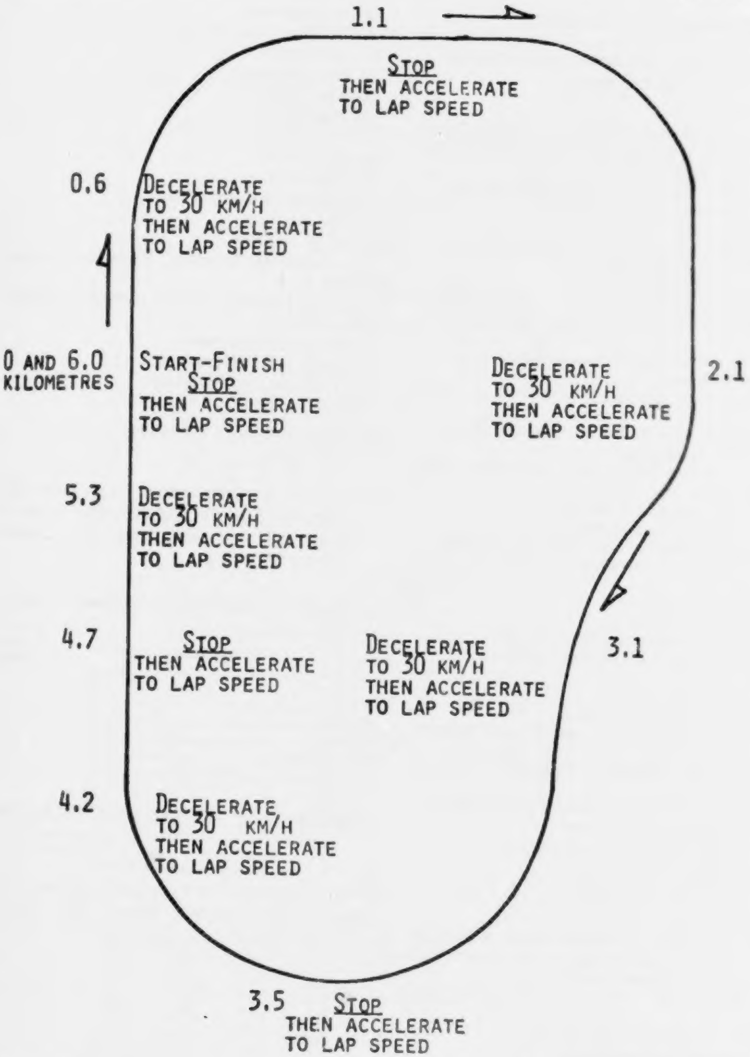
The 10th lap is run at a constant speed.

The 11th lap is begun with a wide open throttle acceleration from stop. A normal deceleration to idle followed by a second wide open throttle acceleration occurs at the midpoint of the lap.

This schedule may be modified with the advance approval of the Administrator if it results in unsafe operation of the vehicle.


0.7
STOP
THEN ACCELERATE
TO LAP SPEED
0.4
DECELERATE
TO 20 M.P.H.
THEN ACCELERATE
TO LAP SPEED
0 AND 3.7
MILES
START-FINISH
STOP
THEN ACCELERATE
TO LAP SPEED
1.3
DECELERATE
TO 20 M.P.H.
THEN ACCELERATE
TO LAP SPEED
3.3
DECELERATE
TO 20 M.P.H.
THEN ACCELERATE
TO LAP SPEED
2.9
STOP
THEN ACCELERATE
TO LAP SPEED
1.9
DECELERATE
TO 20 M.P.H.
THEN ACCELERATE
TO LAP SPEED
2.6
DECELERATE
TO 20 M.P.H.
THEN ACCELERATE
TO LAP SPEED
2.2
STOP
THEN ACCELERATE
TO LAP SPEED

ALL STOPS ARE 15 SECONDS


1.1
STOP
THEN ACCELERATE
TO LAP SPEED
0.6
DECELERATE
TO 30 KM/H
THEN ACCELERATE
TO LAP SPEED
0 AND 6.0
KILOMETRES
START-FINISH
STOP
THEN ACCELERATE
TO LAP SPEED
2.1
DECELERATE
TO 30 KM/H
THEN ACCELERATE
TO LAP SPEED
5.3
DECELERATE
TO 30 KM/H
THEN ACCELERATE
TO LAP SPEED
4.7
STOP
THEN ACCELERATE
TO LAP SPEED
3.1
DECELERATE
TO 30 KM/H
THEN ACCELERATE
TO LAP SPEED
4.2
DECELERATE
TO 30 KM/H
THEN ACCELERATE
TO LAP SPEED
3.5
STOP
THEN ACCELERATE
TO LAP SPEED

[42 FR 33002, June 28, 1977]

ALL STOPS ARE 15 SECONDS

APPENDIX V [RESERVED]

APPENDIX VI—VEHICLE AND ENGINE COMPONENTS

(a) Light-Duty Vehicles, Light-Duty Trucks, Motorcycles, and Gasoline-Fueled Heavy-Duty Engines.

I. Basic Mechanical Components-Engine.

(1) Intake and exhaust valves.

(2) Drive belts.

(3) Manifold and cylinder head bolts.

(4) Engine oil and filter.

(5) Engine coolant.

(6) Cooling system hoses and connections.

(7) Vacuum fittings, hoses, and connections.

(8) Oil injection metering system.

II. Fuel System.

(1) Fuel specification-octane rating, lead content.

(2) Carburetor-idle RPM, mixture ratio.

(3) Choke mechanism.

(4) Fuel system filter and fuel system lines and connections.

(5) Choke plate and linkage.

III. Ignition Components.

(1) Ignition timing and advance systems.

(2) Distributor breaker points and condenser.

(3) Spark plugs.

(4) Ignition wiring.

(5) Operating parts of distributor.

IV. Crankcase Ventilation System.

(1) PCV valve.

(2) Ventilation hoses.

(3) Oil filter breather cap.

(4) Manifold inlet (carburetor spacer, etc.).

V. External Exhaust Emission Control System.

(1) Secondary air injection system hoses.

(2) Air system manifolds.

(3) Control valves and air pump.

(4) Manifold reactors.

(5) Catalytic converters.

(6) Exhaust recirculation.

(7) Water injection.

VI. Evaporative Emission Control System.

(1) Engine compartment hose connections.

(2) Carbon storage media.

(3) Fuel tank pressure-relief valve operation.

(4) Fuel vapor control valves.

VII. Air Inlet Components.

(1) Carburetor air clearner filter.

(2) Hot air control valve.

(b) Diesel Light-Duty Vehicles, Diesel Light-Duty Trucks, and Diesel Heavy-Duty Engines.

I. Engine Mechancial Components.

(1) Valve train.

(2) Cooling system.

a. Coolant.

b. Thermostat.

c. Filter.

(3) Lubrication.

a. Oil filter.

b. Lubricant.

II. Fuel System.

(1) Fuel type.

(2) Fuel pump.

(3) Fuel filters.

(4) Injectors.

(5) Governor.

III. Air Inlet Components.

(1) Air cleaner.

(2) Inlet ducting.

IV. External Exhaust Emission Control System.

(1) Rack limiting devices (aneroid, throttle delay, etc.).

(2) Manifold reactors.

(3) Catalytic converters.

(4) Exhaust recirculation.

(5) Water injection.

[42 FR 33004, June 28, 1977]

APPENDIX X—SAMPLING PLANS FOR SELECTIVE ENFORCEMENT AUDITING OF HEAVY-DUTY ENGINES AND LIGHT-DUTY TRUCKS

TABLE 1—SAMPLING PLAN CODE LETTER

Annual sales	Code letter
50–99	A.
100–299	B.
300–499	C.
500 or greater	D.

TABLE 2—SAMPLING PLAN FOR CODE LETTER "A"

[Sample inspection criteria]

Stage	Pass No.	Fail No.	Stage	Pass No.	Fail No.
1	(1)	(2)	16	6	11
2	(1)	(2)	17	7	12
3	(1)	(2)	18	7	12
4	0	(2)	19	8	13
5	0	(2)	20	8	13
6	1	6	21	9	14
7	1	7	22	10	14
8	2	7	23	10	15
9	2	8	24	11	15
10	3	8	25	11	16
11	3	8	26	12	16
12	4	9	27	12	17
13	5	10	28	13	17
14	5	10	29	14	17
15	6	11	30	16	17

[1] Test sample passing not permitted at this stage.

[2] Test sample failure not permitted at this stage.

TABLE 3—SAMPLING PLAN FOR CODE LETTER "B"

[Sample Inspection Criteria]

Stage	Pass No.	Fail No.
1	(1)	(2)
2	(1)	(2)
3	(1)	(2)
4	(1)	(2)
5	0	(2)
6	1	6
7	1	7
8	2	7
9	2	8
10	3	8
11	3	9
12	4	9
13	4	10
14	5	10
15	5	11
16	6	12
17	6	12
18	7	13
19	8	13
20	8	14
21	9	14
22	9	15
23	10	15
24	10	16
25	11	16
26	11	17
27	12	17
28	12	18
29	13	18
30	13	19
31	14	19
32	14	20
33	15	20
34	16	21
35	16	21
36	17	22
37	17	22
38	18	22
39	18	22
40	21	22

[1] Test sample passing not permitted at this stage.
[2] Test sample failure not permitted at this stage.

TABLE 4—SAMPLING PLAN FOR CODE LETTER "C"

[Sample Inspection Criteria]

Stage	Pass No.	Fail No.
1	[1]	[2]
2	[1]	[2]
3	[1]	[2]
4	[1]	[2]
5	0	[2]
6	0	6
7	1	7
8	2	7
9	2	8
10	3	9
11	3	9
12	4	10
13	4	10
14	5	11
15	5	11
16	6	12
17	6	12
18	7	13
19	7	13
20	8	14
21	8	14
22	9	15
23	10	15
24	10	16
25	11	16
26	11	17
27	12	17
28	12	18
29	13	18
30	13	19
31	14	19
32	14	20
33	15	20
34	15	21
35	16	21
36	16	22
37	17	22
38	18	23
39	18	23
40	19	24
41	19	24
42	20	25
43	20	25
44	21	26
45	21	27
46	22	27
47	22	27
48	23	27
49	23	27
50	26	27

[1] Test sample passing not permitted at this stage.
[2] Test sample failure not permitted at this stage.

TABLE 5—SAMPLING PLAN FOR CODE LETTER "D"

[Sample Inspection Criteria]

Stage	Pass No.	Fail No.
1	(1)	(2)
2	(1)	(2)
3	(1)	(2)
4	(1)	(2)
5	0	(2)
6	0	6
7	1	7
8	2	8
9	2	8
10	3	9
11	3	9
12	4	10
13	4	10
14	5	11
15	5	11
16	6	12
17	6	12
18	7	13
19	7	13
20	8	14
21	8	14
22	9	15

TABLE 5—SAMPLING PLAN FOR CODE LETTER "D"—Continued

[Sample Inspection Criteria]

Stage	Pass No.	Fail No.
23	9	15
24	10	16
25	11	16
26	11	17
27	12	17
28	12	18
29	13	19
30	13	19
31	14	20
32	14	20
33	15	21
34	15	21
35	16	22
36	16	22
37	17	23
38	17	23
39	18	24
40	18	24
41	19	25
42	19	26
43	20	26
44	21	27
45	21	27
46	22	28
47	22	28
48	23	29
49	23	29
50	24	30
51	24	30
52	25	31
53	25	31
54	26	32
55	26	32
56	27	33
57	27	33
58	28	33
59	28	33
60	32	33

[1] Test sample passing not permitted at this stage.
[2] Test sample failure not permitted at this stage.

[48 FR 1414, Jan. 12, 1983, as amended at 48 FR 52209, Nov. 16, 1983]

APPENDIX XI—SAMPLING PLANS FOR SELECTIVE ENFORCEMENT AUDITING OF LIGHT-DUTY VEHICLES

40% AQL

TABLE 1—SAMPLING PLAN CODE LETTER

Annual sales of configuration	Code letter
50–99	A
100–299	B
300–499	C
500 or greater	D

TABLE 2—SAMPLING PLAN FOR CODE LETTER "A" 40% AQL

[Sample inspection criteria]

Stage	Pass No.	Fail No.
1	(1)	(2)
2	(1)	(2)
3	(1)	(2)
4	0	(2)
5	0	(2)
6	1	6
7	1	7
8	2	7
9	2	8
10	3	8
11	3	9
12	4	9
13	5	10
14	5	10
15	6	11
16	6	11
17	7	12
18	7	12
19	8	13
20	8	13
21	9	14
22	10	14
23	10	15
24	11	15
25	11	16
26	12	16
27	12	17
28	13	17
29	14	17
30	16	17

[1] Test sample passing not permitted at this stage.
[2] Test sample failure not permitted at this stage.

TABLE 3—SAMPLING PLAN FOR CODE LETTER "B" 40% AQL

[Sample inspection criteria]

Stage	Pass No.	Fail No.
1	(1)	(2)
2	(1)	(2)
3	(1)	(2)
4	(1)	(2)
5	0	(2)
6	1	6
7	1	7
8	2	7
9	2	8
10	3	8
11	3	9
12	4	9
13	4	10
14	5	10
15	5	11
16	6	12
17	6	12
18	7	13
19	8	13
20	8	14
21	9	14
22	9	15
23	10	15
24	10	16
25	11	16
26	11	17

TABLE 3—SAMPLING PLAN FOR CODE LETTER "B" 40% AQL—Continued

[Sample inspection criteria]

Stage	Pass No.	Fail No.
27	12	17
28	12	18
29	13	18
30	13	19
31	14	19
32	14	20
33	15	20
34	16	21
35	16	21
36	17	22
37	17	22
38	18	22
39	18	22
40	21	22

[1] Test sample passing not permitted at this stage.
[2] Test sample failure not permitted at this stage.

TABLE 4—SAMPLING PLAN FOR CODE LETTER "C" 40% AQL

[Sample inspection criteria]

Stage	Pass No.	Fail No.
1	(1)	(2)
2	(1)	(2)
3	(1)	(2)
4	(1)	(2)
5	0	(2)
6	0	6
7	1	7
8	2	7
9	2	8
10	3	9
11	3	9
12	4	10
13	4	10
14	5	11
15	5	11
16	6	12
17	6	12
18	7	13
19	7	13
20	8	14
21	8	14
22	9	15
23	10	15
24	10	16
25	11	16
26	11	17
27	12	17
28	12	18
29	13	18
30	13	19
31	14	19
32	14	20
33	15	20
34	15	21
35	16	21
36	16	22
37	17	22
38	18	23
39	18	23
40	19	24
41	19	24
42	20	25
43	20	25
44	21	26
45	21	27
46	22	27
47	22	27
48	23	27
49	23	27
50	26	27

[1] Test sample passing not permitted at this stage.
[2] Test sample failure not permitted at this stage.

TABLE 5—SAMPLING PLAN FOR CODE LETTER "D" 40% AQL

[Sample inspection criteria]

Stage	Pass No.	Fail No.
1	(1)	(2)
2	(1)	(2)
3	(1)	(2)
4	(1)	(2)
5	0	(2)
6	0	6
7	1	7
8	2	8
9	2	8
10	3	9
11	3	9
12	4	10
13	4	10
14	5	11
15	5	11
16	6	12
17	6	12
18	7	13
19	7	13
20	8	14
21	8	14
22	9	15
23	9	15
24	10	16
25	11	16
26	11	17
27	12	17
28	12	18
29	13	19
30	13	19
31	14	20
32	14	20
33	15	21
34	15	21
35	16	22
36	16	22
37	17	23
38	17	23
39	18	24
40	18	24
41	19	25
42	19	26
43	20	26
44	21	27
45	21	27
46	22	28
47	22	28
48	23	29

TABLE 5—SAMPLING PLAN FOR CODE LETTER "D" 40% AQL—Continued

[Sample inspection criteria]

Stage	Pass No.	Fail No.
49	23	29
50	24	30
51	24	30
52	25	31
53	25	31
54	26	32
55	26	32
56	27	33
57	27	33
58	28	33
59	28	33
60	32	33

[1] Test sample passing not permitted at this stage.
[2] Test sample failure not permitted at this stage.

[49 FR 48485, Dec. 12, 1984]

APPENDIX XII—TABLES FOR PRODUCTION COMPLIANCE AUDITING OF HEAVY-DUTY ENGINES AND HEAVY-DUTY VEHICLES, INCLUDING LIGHT-DUTY TRUCKS

TABLE 1—COMPLIANCE LEVEL DETERMINATION USING THE PRIMARY PCA SAMPLING PLAN

	Compliance level [2]
PCA test sample size.[1]	
24	15
25	15
26	16
27	17
28	17
29	18
30	18
31	19
32	20
33	20
34	21
35	21
36	22
37	23
38	23
39	24
40	24
41	25
42	26
43	26
44	27
45	27
46	28
47	29
48	29
49	30
50	30
51	31
52	32
53	32
54	33
55	33
56	34
57	35
58	35
59	36
60	36

[1] Including the number of SEA tests if applicable.
[2] Is the test result of the sequence number: (The lowest test result is sequence No. 1).

TABLE 2—VALUES OF K FOR THE REDUCED FIXED PCA SAMPLING PLAN

	Value of K
Sample size:	
3	1.602
4	1.114
5	0.886
6	0.764
7	0.674
8	0.608
9	0.565
10	0.513
11	0.478
12	0.448
13	0.422
14	0.399
15	0.379
16	0.360
17	0.343
18	0.328
19	0.314
20	0.301
21	0.289
22	0.277
23	0.266

TABLE 3—VALUES OF K FOR THE REDUCED SEQUENTIAL PCA SAMPLING PLAN

	Value of K
Sample size:	
4	1.671
8	0.912
12	0.672
16	0.540
20	0.461

[50 FR 35401, Aug. 30, 1985]

PART 87—CONTROL OF AIR POLLUTION FROM AIRCRAFT AND AIRCRAFT ENGINES

Subpart A—General Provisions

Sec.
87.1 Definitions.
87.2 Abbreviations.
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87.7 Exemptions.

Subpart B—Engine Fuel Venting Emissions (New and In-Use Aircraft Gas Turbine Engines)

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87.20 Applicability.
87.21 Standards for exhaust emissions.

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87.30 Applicability.
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87.60 Introduction.
87.61 Turbine fuel specifications.
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87.63 [Reserved]
87.64 Sampling and analytical procedures for measuring gaseous exhaust emissions.
87.65—87.70 [Reserved]
87.71 Compliance with gaseous emission standards.

Subpart H—Test Procedures for Engine Smoke Emissions (Aircraft Gas Turbine Engines)

87.80 Introduction.
87.81 Fuel specifications.
87.82 Sampling and analytical procedures for measuring smoke exhaust emissions.
87.83—87.88 [Reserved]
87.89 Compliance with smoke emission standards.

AUTHORITY: Secs. 231, 301(a), Clean Air Act, as amended (42 U.S.C. 7571, 7601(a)).

SOURCE: 47 FR 58470, Dec. 30, 1982, unless otherwise noted.

Subpart A—General Provisions

§ 87.1 Definitions.

(a) As used in this part, all terms not defined herein shall have the meaning given them in the Act:

"Act" means the Clean Air Act, as amended (42 U.S.C. 7401 et seq.).

"Administrator" means the Administrator of the Environmental Protection Agency and any other officer or employee of the Environmental Protection Agency to whom authority involved may be delegated.

"Aircraft" means any airplane for which a U.S. standard airworthiness certificate or equivalent foreign airworthiness certificate is issued.

"Aircraft engine" means a propulsion engine which is installed in or which is manufactured for installation in an aircraft.

"Aircraft gas turbine engine" means a turboprop, turbofan, or turbojet aircraft engine.

"Class TP" means all aircraft turboprop engines.

"Class TF" means all turbofan or turbojet aircraft engines except engines of Class T3, T8, and TSS.

"Class T3" means all aircraft gas turbine engines of the JT3D model family.

"Class T8" means all aircraft gas turbine engines of the JT8D model family.

"Class TSS" means all aircraft gas turbine engines employed for propulsion of aircraft designed to operate at supersonic flight speeds.

"Commercial aircraft engine" means any aircraft engine used or intended for use by an "air carrier," (including those engaged in "intrastate air transportation") or a "commercial operator" (including those engaged in "intrastate air transportation") as these terms are defined in the Federal Aviation Act and the Federal Aviation Regulations.

"Commercial aircraft gas turbine engine" means a turboprop, turbofan, or turbojet commercial aircraft engine.

"Emission measurement system" means all of the equipment necessary to transport and measure the level of emissions. This includes the sample system and the instrumentation system.

"Engine Model" means all commercial aircraft turbine engines which are of the same general series, displacement, and design characteristics and are usually approved under the same type certificate.

"Exhaust emissions" means substances emitted to the atmosphere from the exhaust discharge nozzle of an aircraft or aircraft engine.

"Fuel venting emissions" means raw fuel, exclusive of hydrocarbons in the exhaust emissions, discharged from aircraft gas turbine engines during all normal ground and flight operations.

"In-use aircraft gas turbine engine" means an aircraft gas turbine engine which is in service.

"New aircraft turbine engine" means an aircraft gas turbine engine which has never been in service.

"Power setting" means the power or thrust output of an engine in terms of kilonewtons thrust for turbojet and turbofan engines and shaft power in terms of kilowatts for turboprop engines.

"Rated output (rO)" means the maximum power/thrust available for takeoff at standard day conditions as approved for the engine by the Federal Aviation Administration, including reheat contribution where applicable, but excluding any contribution due to water injection.

"Rated pressure ratio (rPR)" means the ratio between the combustor inlet pressure and the engine inlet pressure achieved by an engine operating at rated output.

"Sample system" means the system which provides for the transportation of the gaseous emission sample from the sample probe to the inlet of the instrumentation system.

"Secretary" means the Secretary of Transportation and any other officer or employee of the Department of Transportation to whom the authority involved may be delegated.

"Shaft power" means only the measured shaft power output of a turboprop engine.

"Smoke" means the matter in exhaust emissions which obscures the transmission of light.

"Smoke number (SN)" means the dimensionless term quantifying smoke emissions.

"Standard day conditions" means standard ambient conditions as described in the United States Standard Atmosphere, 1976, (i.e., Temperature $=15^\circ$C, specific humidity $=0.00$ kg/ H_2O/kg dry air, and pressure $=101325$ Pa.)

"Taxi/idle (in)" means those aircraft operations involving taxi and idle between the time of landing roll-out and final shutdown of all propulsion engines.

"Taxi/idle (out)" means those aircraft operations involving taxi and idle between the time of initial starting of the propulsion engine(s) used for the taxi and turn on to duty runway.

[47 FR 58470, Dec. 30, 1982, as amended at 49 FR 31875, Aug. 9, 1984]

§ 87.2 Abbreviations.

The abbreviations used in this part have the following meanings in both upper and lower case:

FAA Federal Aviation Administration, Department of Transportation.
HC Hydrocarbon(s).
hr. Hour(s).
LTO Landing takeoff
min. Minute(s).
rO Rated output.
rPR Rated pressure ratio.
sec. Seconds.
SP Shaft power.
SN Smoke number.
T Temperature, degrees Kelvin.
TIM Time in mode.
W Watt(s).
° Degree.
% Percent.

[47 FR 58470, Dec. 30, 1982, as amended at 49 FR 31875, Aug. 9, 1984]

§ 87.3 General requirements.

(a) This part provides for the approval or acceptance by the Administrator or the Secretary of testing and sampling methods, analytical, techniques, and related equipment not identical to those specified in this part. Before either approves or accepts any such alternate, equivalent, or otherwise nonidentical procedures or equipment, the Administrator or the Secretary shall consult with the other in determining whether or not the action requires rulemaking under sections 231 and 232 of the Clean Air Act, as amended, consistent with the Administrator's and the Secretary's responsibilities under sections 231 and 232 of the Act. (42 U.S.C. 7571, 7572).

(b) Under section 232 of the Act, the Secretary issues regulations to insure compliance with this part.

(c) With respect to aircraft of foreign registry, these regulations shall apply in a manner consistent with any obligation assumed by the United States in any treaty, convention or agreement between the United States and any foreign country or foreign countries.

§ 87.4 [Reserved]

§ 87.5 Special test procedures.

The Administrator or the Secretary may, upon written application by a manufacturer or operator of aircraft or aircraft engines, approve test procedures for any aircraft or aircraft engine that is not susceptible to satisfactory testing by the procedures set forth herein. Prior to taking action on any such application, the Administrator or the Secretary shall consult with the other.

§ 87.6 Aircraft safety.

The provisions of this part will be revised if at any time the Secretary determines that an emission standard cannot be met within the specified time without creating a safety hazard.

§ 87.7 Exemptions.

(a) *Exemptions based on flights for short durations at infrequent intervals.* The emission standards of this part do not apply to engines which power aircraft operated in the United States for short durations at infrequent intervals. Such operations are limited to:

(1) Flights of an aircraft for the purpose of export to a foreign country, including any flights essential to demonstrate the integrity of an aircraft prior to its flight to a point outside the United States.

(2) Flights to a base where repairs, alterations or maintenance are to be performed, or to a point of storage, and flights for the purpose of returning an aircraft to service.

(3) Official visits by representatives of foreign governments.

(4) Other flights the Secretary determines, after consultation with the Administrator, to be for short durations at infrequent intervals. A request for such a determination shall be made before the flight takes place.

(b) *Exemptions for very low production models.* The emissions standards of this part do not apply to engines of very low total production after the date of applicability. For the purpose of this part, "very low production" is limited to a maximum total production for United States civil aviation applications of no more than 200 units covered by the same type certificate after January 1, 1984.

(1) A maximum annual production rate after January 1, 1984 of 20 units covered by the same type certificate; and

(2) A maximum total production after January 1, 1984 of 200 units covered by the same type certificate.

(c) *Exemptions for New Engines in Other Categories.* The emissions standards of this part do not apply to engines for which the Secretary determines, with the concurrence of the Administrator, that application of any standard under § 87.21 is not justified, based upon consideration of:

(1) Adverse economic impact on the manufacturer.

(2) Adverse economic impact on the aircraft and airline industries at large.

(3) Equity in administering the standards among all economically competing parties.

(4) Public health and welfare effects.

(5) Other factors which the Secretary, after consultation with the Administrator, may deem relevant to the case in question.

(d) *Time Limited Exemptions for In Use Engines.* The emissions standards of this part do not apply to aircraft or aircraft engines for time periods which the Secretary determines, with the concurrence of the Administrator, that any applicable standard under § 87.11(a), § 87.31(a), or § 87.31(c), should not be applied based upon consideration of the following:

(1) Documentation demonstrating that all good faith efforts to achieve compliance with such standard have been made.

(2) Documentation demonstrating that the inability to comply with such standard is due to circumstances beyond the control of the owner or operator of the aircraft.

(3) A plan in which the owner or operator of the aircraft shows that he will achieve compliance in the shortest time which is feasible.

(4) Applications for a determination that any requirements of § 87.11(a), § 87.31(a) or § 87.31(c) do not apply shall be submitted in duplicate to the Secretary in accordance with procedures established by the Secretary.

(e) The Secretary shall publish in the FEDERAL REGISTER the name of the organization to whom exemptions are granted and the period of such exemptions.

(f) No state or political subdivision thereof may attempt to enforce a standard respecting emissions from an aircraft or engine if such aircraft or engine has been exempted from such standard under this part.

[47 FR 58470, Dec. 30, 1982, as amended at 49 FR 31875, Aug. 9, 1984; 49 FR 41002, Oct. 18, 1984]

Subpart B—Engine Fuel Venting Emissions (New and In-Use Aircraft Gas Turbine Engines)

§ 87.10 Applicability.

(a) The provisions of this subpart are applicable to all new aircraft gas turbines of classes T3, T8, TSS and TF equal to or greater than 36 kilonewton rated output, manufactured on or after January 1, 1974, and to all in-use aircraft gas turbine engines of classes T3, T8, TSS and TF equal to or greater than 36 kilonewton rated output manufactured after February 1, 1974.

(b) The provisions of this subpart are also applicable to all new aircraft gas turbines of class TF less than 36 kilonewton rated output and class TP manufactured on or after January 1, 1975 and to all in-use aircraft gas turbines of class TF less than 36 kilonewton rated output and class TP manufactured after January 1, 1975.

[49 FR 41002, Oct. 18, 1984]

§ 87.11 Standard for fuel venting emissions.

(a) No fuel venting emissions shall be discharged into the atmosphere from any new or in-use aircraft gas turbine engine subject to the subpart. This paragraph is directed at the elimination of intentional discharge to the atmosphere of fuel drained from fuel nozzle manifolds after engines are shut down and does not apply to normal fuel seepage from shaft seals, joints, and fittings.

(b) Conformity with the standard set forth in paragraph (a) of this section shall be determined by inspection of the method designed to eliminate these emissions.

Subpart C—Exhaust Emissions (New Aircraft Gas Turbine Engines)

§ 87.20 Applicability.

The provisions of this subpart are applicable to all aircraft gas turbine engines of the classes specified beginning on the dates specified.

§ 87.21 Standards for exhaust emissions.

(a) Exhaust emissions of smoke from each new aircraft gas turbine engine of class T8 manufactured on or after February 1, 1974, shall not exceed: Smoke number of 30.

(b) Exhaust emissions of smoke from each new aircraft gas turbine engine of class TF and of rated output of 129 kilonewtons thrust or greater, manufactured on or after January 1, 1976, shall not exceed:

$SN=83.6(r0)^{-0.274}$ (r0 is in kilonewtons)

(c) Exhaust emission of smoke from each new aircraft gas turbine engine of class T3 manufactured on or after January 1, 1978, shall not exceed: Smoke number of 25.

(d) Gaseous exhaust emissions from each new commercial aircraft gas turbine engine that is manufactured on or after January 1, 1984, shall not exceed:

(1) Classes TF, T3, T8 engines equal to or greater than 26.7 kilonewtons rated output:

Hydrocarbons: 19.6 grams/kilonewton r0.

(2) Class TSS:

Hydrocarbons$=140(0.92)^{rPR}$ grams/kilonewton r0.

(e) Smoke exhaust emissions from each gas turbine engine of the classes specified below shall not exceed:

(1) Class TF of rated output less than 26.7 kilonewtons manufactured on or after (one year from date of publication):

$SN=83.6(ro)^{-0.274}$ (ro is in kilonewtons) not to exceed a maximum of $SN=50$.

(2) Classes T3, T8, TSS and TF of rated output equal to or greater than 26.7 kilonewtons manufactured on or after January 1, 1984:

$SN=83.6(ro)^{-0.274}$ (ro is in kilonewtons) not to exceed a maximum of $SN=50$.

(3) Class TP of rated output equal to or greater than 1,000 kilowatts manufactured on or after January 1, 1984:

$SN=187(ro)^{-.168}$ (ro is in kilowatts)

(f) The standards set forth in paragraphs (a), (b), (c), (d), and (e) of this section refer to a composite gaseous emission sample representing the operating cycles set forth in the applicable sections of Subpart G of this part, and exhaust smoke emissions emitted during operations of the engine as specified in the applicable sections of Subpart H of this part, measured and calculated in accordance with the procedures set forth in those subparts.

[47 FR 58470, Dec. 30, 1982, as amended at 49 FR 31875, Aug. 9, 1984]

Subpart D—Exhaust Emissions (In-use Aircraft Gas Turbine Engines)

§ 87.30 Applicability.

The provisions of this subpart are applicable to all in-use aircraft gas turbine engines certified for operation within the United States of the classes specified beginning on the dates specified.

§ 87.31 Standards for exhaust emissions.

(a) Exhaust emissions of smoke from each in-use aircraft gas turbine engine of Class T8, beginning February 1, 1974, shall not exceed: Smoke number of 30.

(b) Exhaust emissions of smoke from each in-use aircraft gas turbine engine of class TF and of rated output of 129 kilonewtons thrust or greater, beginning January 1, 1976, shall not exceed:

$SN=83.6(r0)^{-0.274}$ (r0 is in kilonewtons).

(c) The standards set forth in paragraphs (a) and (b) of this section refer to exhaust smoke emissions emitted during operations of the engine as specified in the applicable section of Subpart H of this part, and measured and calculated in accordance with the procedures set forth in this subpart.

[47 FR 58470, Dec. 30, 1982, as amended at 48 FR 2718, Jan. 20, 1983]

Subparts E–F—[Reserved]

Subpart G—Test Procedures for Engine Exhaust Gaseous Emissions (Aircraft and Aircraft Gas Turbine Engines)

§ 87.60 Introduction.

(a) Except as provided under § 87.5, the procedures described in this subpart shall be the test program to determine the conformity of new aircraft gas turbine engines with the applicable standards set forth in this part.

(b) The test consists of operating the engine at prescribed power settings on an engine dynamometer (for engines producing primarily shaft power) or thrust measuring test stand (for engines producing primarily thrust). The exhaust gases generated during engine operation are sampled continuously for specific component analysis through the analytical train.

(c) The exhaust emission test is designed to measure hydrocarbons, carbon monoxide and carbon dioxide concentrations, and to determine mass emissions through calculations during a simulated aircraft landing-takeoff cycle (LTO). The LTO cycle is based on time in mode data during high activity periods at major airports. The test for propulsion engines consists of a least the following four modes of engine operation: Taxi/idle, takeoff, climbout, and approach. The mass

best copy available

emission for the modes are combined to yield the reported values.

(d) When an engine is tested for exhaust emissions on an engine dynamometer or test stand, the complete engine shall be used with all accessories which might reasonably be expected to influence emissions to the atmosphere installed and functioning, if not otherwise prohibited by § 87.62(a)(2). Use of service air bleed and shaft power extraction to power auxiliary gearbox-mounted components required to drive aircraft systems is not permitted.

(e) Other gaseous emissions measurement systems may be used if shown to yield equivalent results and if approved in advance by the Administrator or the Secretary.

[47 FR 58470, Dec. 30, 1982, as amended at 49 FR 31875, Aug. 9, 1984]

§ 87.61 Turbine fuel specifications.

For exhaust emission testing, fuel meeting the specifications listed below shall be used. Additives used for the purpose of smoke suppression (such as organometallic compounds) shall not be present.

Property and Allowable Range of Values

Specific gravity at 15 °C: 0.78–0.82.
Distillation temperature, °C: 10% boiling point, 160–201; final boiling point, 240–285.
Net heat of combustion, kJ/kg: 42,860–43,500.
Aromatics, volume %: 15–20.
Naphthalenes, volume %: 1.0–3.0.
Smoke point, mm: 20–28.
Hydrogen, mass %: 13.4–14.0.
Sulfur, mass %: less than 0.3%.
Kinematic viscosity at −20 °C, mm/s: 4.0–6.5.

[49 FR 41002, Oct. 18, 1984]

§ 87.62 Test procedure (propulsion engines).

(a)(1) The engine shall be tested in each of the following engine operating modes which simulate aircraft operation to determine its mass emission rates. The actual power setting, when corrected to standard day conditions, should correspond to the following percentages of rated output. Analytical correction for variations from reference day conditions and minor variations in actual power setting should be specified and/or approved by the Secretary:

Mode	Class		
	TP	TF, T3, T8	TSS
Taxi/idle	([1])	([1])	([1])
Takeoff	100	100	100
Climbout	90	85	65
Descent	NA	NA	15
Approach	30	30	34

[1] See paragraph (a)(2) of this section.

(2) The taxi/idle operating modes shall be carried out at a power setting of 7% rated thrust unless the Secretary determines that the unique characteristics of an engine model undergoing certification testing at 7% would result in substantially different HC emissions than if the engine model were tested at the manufacturers recommended idle power setting. In such cases the Secretary shall specify an alternative test condition.

(3) The times in mode (TIM) shall be as specified below:

Mode	Class		
	TP	TF, T3 or T8	TSS
Taxi/idle (minutes)	26.0	26.0	26.0
Takeoff	0.5	0.7	1.2
Climbout	2.5	2.2	2.0
Descent	N/A	N/A	1.2
Approach	4.5	4.0	2.3

(b) Emissions testing shall be conducted on warmed-up engines which have achieved a steady operating temperature.

§ 87.63 [Reserved]

§ 87.64 Sampling and analytical procedures for measuring gaseous exhaust emissions.

The system and procedures for sampling and measurement of gaseous emissions shall be as specified by Appendices 3 and 5 to ICAO Annex 16, Volume II, Aircraft Engine Emissions, First Edition, June 1981, which are incorporated herein by reference. This document can be obtained from the International Civil Aviation Organization, P.O. Box 400, Succursale: Place de L'Aviation Internationale, 1000 Sherbrooke Street West, Montreal, Quebec, Canada H3A 2R2 at $3.00 per copy. It is also available for inspection at the Office of the Federal Register Information Center, Room 8301, 1100 L Street, N.W., Washington, D.C. 20408. This incorporation by reference was approved by the Director of the Federal Register on September 3, 1982. These materials are incorporated as they exist on the date of the approval and a notice of any change in these materials will be published in the FEDERAL REGISTER. Frequent changes are not anticipated.

§§ 87.65—87.70 [Reserved]

§ 87.71 Compliance with gaseous emission standards.

Compliance with each gaseous emission standard by an aircraft engine shall be determined by comparing the pollutant level in grams/kilonewton/thrust/cycle or grams/kilowatt/cycle as calculated in § 87.64 with the applicable emission standard under this part.

Subpart H—Test Procedures for Engine Smoke Emissions (Aircraft Gas Turbine Engines)

§ 87.80 Introduction.

Except as provided under §87.5, the procedures described in this subpart shall be the test program to determine the conformity of new and in-use gas turbine engines with the applicable standards set forth in this part. The test is essentially the same as that described in §§ 87.60 through 87.62, except that the test is designed to determine the smoke emission level at various operating points representative of engine usage in aircraft. Other smoke measurement systems may be used if shown to yield equivalent results and if approved in advance by the Administrator or the Secretary.

§ 87.81 Fuel specifications.

Fuel having specifications as provided in § 87.61 shall be used in smoke emission testing.

§ 87.82 Sampling and analytical procedures for measuring smoke exhaust emissions.

The system and procedures for sampling and measurement of smoke emissions shall be as specified by Appendix 2, Volume II, Aircraft Engine Emissions to ICAO Annex 16, Aircraft Engine Emissions, First Edition, June, 1981. This document can be obtained from the International Civil Aviation Organization, P.O. Box 400, Succursale: Place de L'Aviation Internationale, 1000 Sherbrooke Street West, Montreal, Quebec, Canada H3A 2R2 at $3.00 per copy. It is also available for inspection at the Office of the Federal Register Information Center, Room 8301, 1100 L Street, N.W., Washington, D.C. 20408. This incorporation by reference was approved by the Director of the Federal Register on September 3, 1982. These materials are incorporated as they exist on the date of the approval and a notice of any change in these materials will be published in the FEDERAL REGISTER. Frequent changes are not anticipated.

§§ 87.83—87.88 [Reserved]

§ 87.89 Compliance with smoke emission standards.

Compliance with each smoke emission standard shall be determined by comparing the plot of SN as a function of power setting with the applicable emission standard under this part. The SN at every power setting must be such that there is a high degree of confidence that the standard will not be exceeded by any engine of the model being tested. The level of confidence required, a practical interpretation of the requirement for total compliance, and a testing program to assure compliance will be established by the Secretary prior to January 1, 1984, and shall be approved by the Administrator.

PARTS 88–99—[RESERVED]

FINDING AIDS

A list of CFR titles, subtitles, chapters, subchapters and parts and an alphabetical list of agencies publishing in the CFR are included in the CFR Index and Finding Aids volume to the Code of Federal Regulations which is published separately and revised annually.

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(Revised as of June 29, 1990)

The Director of the Federal Register has approved under 5 U.S.C. 552(a) and 1 CFR Part 51 the incorporation by reference of the following publications. This list contains only those incorporations by reference effective as of the revision date of this volume. Incorporations by reference found within a regulation are effective upon the effective date of that regulation. For more information on incorporation by reference, see the preliminary pages of this volume.

40 CFR, CHAPTER I (PARTS 86 TO 99): SUBCHAPTER C—AIR PROGRAMS ENVIRONMENTAL PROTECTION AGENCY

	40 CFR
American Society for Testing and Materials 1916 Race Street, Philadelphia, PA 19103	
International Civil Aviation Organization PO Box 400, Succurale: Place de L'Aviation International, 1000 Sherbrooke Street West, Montreal, Quebec, Canada H3A2R2	
ICAO Annex 16, Volume II, Aircraft Engine Emissions (June 1981)..........	87.64; 87.82
Society of Automotive Engineers 400 Commonwealth Dr. Warrendale, PA 15096	
SAE Recommend Practice J 1151 (Nov. 79) Methane Measurement Using Gas Chromatography.	Part 86

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[1] No corresponding prior section.

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Title 40 was established at 36 FR 12213, June 29, 1971. For the period before January 1, 1973, see the "List of CFR Sections Affected, 1964-1972," which is published in a separate volume.

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